[redacted]

#537

PIONEER VENUS 1

UNIFIED ABSTRACT DATA SYSTEM (UADS)

LOW FREQUENCY DATA

78-051A-01A,02B,07A,11A,12A,15B,17A,13A, 18C

[redacted]

REQ. AGENT	RAND NO.	ACQ. AGENT
GLS	V0136	WSC

PIONEER VENUS 1

UNIFIED ABSTRACT DATA SYSTEM (UADS)

LOW FREQUENCY DATA

78-051A-01A,02B,07A,11A,12A,13A,15B,17A,18C

This data set catalog consists of 10 magnetic tapes. Each tape is 800 BPI, Binary, 9-track and contains 3 files, Tape description file, Status file, and Data file. These tapes were created on an IBM computer. The following list the D# and C# and the time spans of each tape.

D#	C#	TIME SPAN
D-48011	C-22278	12/05/78 - 01/10/79
D-48012	C-22279	01/11/79 - 05/15/79
D-48013	C-22280	05/16/79 - 08/12/79
D-48014	C-22281	09/12/79 - 01/15/80
D-48015	C-22282	01/16/80 - 04/04/80
D-48016	C-22283	04/05/80 - 08/07/80
D-48017	C-22284	08/08/80 - 12/11/80
D-48018	C-22285	12/12/80 - 05/16/81
D-48019	C-22286	05/17/81 - 09/18/81
D-48020	C-22287	09/19/81 - 11/26/81

B-36538-000A - USER'S GUIDE FOR PIONEER VENUS QUICK LOOK DATA SYSTEM (QLDS) AND UNIFIED ABSTRACT DATA SYSTEM (UADS) IS AVAILABLE ON MICROFICHE.

PIONEER VENUS 1

RADAR MEASUREMENT (UADS-LFD FILE)

78-051A-01A,02B,07A,11A,12A,13A,15B,17A,18C

THIS DATA SET HAS BEEN RESTORED. ORIGINALLY THERE WERE 10 9-TRACK, 800 BPI TAPES WRITTEN IN BINARY. THERE ARE TWO RESTORED TAPES. THE TAPES WERE CREATED ON AN IBM 360 COMPUTER. THE DR TAPES ARE 3480 CARTRIDGES AND THE DS TAPES ARE 9-TRACK, 6250 BPI. THE DR AND DS NUMBERS ALONG WITH THE CORRESPONDING D NUMBERS AND THE TIME SPANS ARE AS FOLLOWS:

DR#	DS#	D#	FILES	TIME SPAN
DR03717	DS03717	D48011	1-3	12/05/78 - 01/10/79
		D48012	4-6	01/10/79 - 05/15/79
		D48013	7-9	05/16/79 - 08/12/79
		D48014	10-12	08/12/79 - 01/15/80
		D48015	13-15	01/16/80 - 04/05/80
DR03718	DS03718	D48016	1-3	04/06/80 - 08/08/80
		D48017	4-6	08/09/80 - 12/12/80
		D48018	7-9	12/13/80 - 05/16/81
		D48019	10-12	05/17/81 - 09/18/81
		D48020	13-15	09/19/81 - 11/16/81

October 17, 1984

To: Memo for the record

From: R. Parthasarathy, NSSDC/WDC-A

Subject: Pioneer Venus Orbiter Data tapes.

There have arisen some questions about the quality and/or completeness of the PVO data. Even though the documentation that accompany the data tapes do contain cautionary notes, the following information should be included with the documentation.

1. The NSSDC data are all>12-second averages. The PVO investigators have, however, used fine structure data in their past publications. But they have generally greater confidence in the>12-second averages.

2. Timing accuracy of the data has not been quite satisfactory. Data from one experiment may have a relative shift of as much as 12 seconds with respect to the data from another experiment. Efforts to synchronize the data are underway, but completion of the task may be long delayed.

3. The data from ONMS experiment may be prone to inaccuracies arising from contamination. For example, surface reactions in the ion chamber tended to convert CO and O into CO_2. Likewise N and O to NO. This problem worsens at the higher, tenuous altitudes because of the trapped contaminants from the lower altitudes. The data tapes exclude orbits which in the judgement of the investigators were highly contaminated.

4. The data from the OIMS experiment is believed by the investigators to be reliable in the altitude range below 160 km. But there is a problem of compatability of the data with those from other plasma instruments. At the higher altitudes, the data may be progressively poorer, because there has been no reliable handle on the problem of inherent ion drifts. Certainly, data above 300 km is quite suspect. The investigators have chosen to exclude from the NSSDC tapes stretches of data which they consider to be very uncertain. -14

5. The data from the OETP experiment are 60-second averages. Further, the T_e values for the first 600 orbits may have been underestimated by several percent. Furthermore, the night electron population often revealed two components, hot and cold. The T_e values pertain to the dominant component only. But the N_e data include both the components. -01

6. Our information is that the OMAG experiment is relatively problem-free. The data tapes, however, provide only 24-second averages, every 12 seconds. Some interesting fine structures, such as flux ropes, that are noted by the investigators are therefore smoothed out in the NSSDC tapes. -12

7. The ORPA experiment had sampled electron and ion temperatures at infrequent intervals. But the NSSDC data tapes contain data at uniform intervals as agreed upon. Clearly it was necessary to interpolate the temperatures between the observed intervals, entailing some uncertainly about the data in the tapes. This uncertainty is greater for the night side temperatures since data sampling was done even less frequently. Another source of inaccuracy in the values of T_e and T_i is that the observed current-vs-voltage curve had to be fitted to a theoretical shape before obtaining the temperatures. This fitting was done by a computer and it was not possible to assess the correctness of the fit by visual inspection for the voluminous data supplied to the NSSDC. -07

FORMAT OF PIONEER 12 LOW FREQUENCY DATA (LFD) TAPE 006

The Pioneer Venus Low Frequency Data Tape 006 contains the Pioneer Venus orbiting spacecraft's processed Low Frequency Data for Orbits 1 through 37. The data has been recorded on a 9-track tape at a 800 bpi density. Since this tape was created on an IBM machine, the EBCDIC character set and IBM floating point number format were used where applicable. There are three files on this tape. Each file is followed by a single end-of-file mark. These files in the order of their occurrence are:

FILE 1 - TAPE DESCRIPTION FILE

This file consists of 125 80-character records. Its purpose is to provide a readily available description of the data contained in the tape's second and third files. The file is blocked one logical record per physical record and is wholly comprised of printable EBCDIC characters. See Attachment 1 for a printed copy of this file's contents.

FILE 2 - STATUS FILE

This file consists of 37 266-character records. There is one record for each of the 37 orbits included on this tape. All data is in EBCDIC, printable characters. The data included in each record is as follows:

Bytes	Data	Format	
1-4	Number of orbit described by this record	dddd	4 char
5-10	Date of orbit	yy:DOY	6 char
11-22	UT start time of data included for orbit	HH:MM:SS.MIL	12 char
23-34	UT stop time of data included for orbit	HH:MM:SS.MIL	12 char
35-46	UT of orbit's periapsis	HH:MM:SS.MIL	12 char
47-50	Name of instrument 1	aaaa	4 char
51-52	Number of variables for instrument 1	dd	2 char
53-60	Last date data entered for instrument 1-orbit	MM/DD/YY	8 char
61-64	Total amount of data for instrument 1 for orbit	dddd	4 char
65-68	Total number of instances of "no data avail" for instrument 1 for orbit	dddd	4 char
69-72	Name of instrument 2	aaaa	4 char
73-74	Number of variables for instrument 2	dd	2 char
75-82	Last date data entered for instrument 2-orbit	MM/DD/YY	8 char

83-86	Total amount of data for instrument 2 for orbit	dddd	4 char
87-90	Total number of instances of "no data avail" for instrument 2 for orbit	dddd	4 char
91-94	Name of instrument 3	aaaa	4 char
95-96	Number of variables for instrument 3	dd	2 char
97-104	Last date data entered for instrument 3-orbit	MM/DD/YY	8 char
105-108	Total amount of data for instrument 3 for orbit	dddd	4 char
109-112	Total number of instances of "no data avail" for instrument 3 for orbit	dddd	4 char
113-116	Name of instrument 4	aaaa	4 char
117-118	Number of variables for instrument 4	dd	2 char
119-126	Last date data entered for instrument 4-orbit	MM/DD/YY	8 char
127-130	Total amount of data for instrument 4 for orbit	dddd	4 char
131-134	Total number of instances of "no data avail" for instrument 4 for orbit	dddd	4 char
135-138	Name of instrument 5	aaaa	4 char
139-140	Number of variables for instrument 5	dd	2 char
141-148	Last date data entered for instrument 5-orbit	MM/DD/YY	8 char
149-152	Total amount of data for instrument 5 for orbit	dddd	4 char
153-156	Total number of instances of "no data avail" for instrument 5 for orbit	dddd	4 char
157-160	Name of instrument 6	aaaa	4 char
161-162	Number of variables for instrument 6	dd	2 char
163-170	Last date data entered for instrument 6-orbit	MM/DD/YY	8 char
171-174	Total amount of data for instrument 6 for orbit	dddd	4 char
175-178	Total number of instances of "no data avail" for instrument 6 for orbit	dddd	4 char
179-182	Name of instrument 7	aaaa	4 char
183-184	Number of variables for instrument 7	dd	2 char

185-192	Last date data entered for instrument 7-orbit	MM/DD/YY	8 char
193-196	Total amount of data for instrument 7 for orbit	dddd	4 char
197-200	Total number of instances of "no data avail" for instrument 7 for orbit	dddd	4 char
201-204	Name of instrument 8	aaaa	4 char
205-206	Number of variables for instrument 8	dd	2 char
207-214	Last date data entered for instrument 8-orbit	MM/DD/YY	8 char
215-218	Total amount of data for instrument 8 for orbit	dddd	4 char
219-222	Total number of instances of "no data avail" for instrument 8 for orbit	dddd	4 char
223-226	Name of instrument 9	aaaa	4 char
227-228	Number of variables for instrument 9	dd	2 char
229-236	Last date data entered for instrument 9-orbit	MM/DD/YY	8 char
237-240	Total amount of data for instrument 9 for orbit	dddd	4 char
241-244	Total number of instances of "no data avail" for instrument 9 for orbit	dddd	4 char
245-248	Name of instrument 10	aaaa	4 char
249-250	Number of variables for instrument 10	dd	2 char
251-258	Last date data entered for instrument 10-orbit	MM/DD/YY	8 char
259-262	Total amount of data for instrument 10	dddd	4 char
263-266	Total number of instances of "no data avail" for instrument 10 for orbit	dddd	4 char

FILE 3 - DATA FILE

This file consists of 11,137 396-byte logical records. The logical records are packed ten to a physical record. There are 301 logical records for each of the 37 orbits. These records contain the processed orbital data centered around periapsis sampled at approximately 12-second intervals.

Logical records 1 through 301, inclusive, contain the data for orbit 1. Logical records 302 through 602, inclusive, contain the data for orbit 2, etc.

The first logical record for each orbit contains the data for all of the instruments' variables sampled at the UT start time specified for the orbit in its status record (File 2). The orbit's second logical record contains the instruments' variables' data sampled 12 seconds after the UT start time. The

orbit's third logical record contains the instruments' variables' data sampled 24 seconds after the UT time, etc. The one hundred and fifty-first logical record for an orbit contains the variables' data sampled at the time of periapsis, as specified in the orbit's status record. Due to the characteristics of the available unprocessed data, there may not exist a 12 second interval between the sampling times of the periapsis data in logical record 151 and the data in logical records 150 and 152 for an orbit. However, there will be 12 second intervals between the sampling times of the data in an orbit's records 152 through 301. Therefore, the sampling time of each of an orbit's records may be calculated from the UT start, UT periapsis, and UT stop times in the orbit's status record. It is also available in each record's UTMS and UTYD variables.

Two special values were reserved to indicate the two possible null data conditons. When the LFD data base was initialized, all of the variables' values were set to hexadecimal X'FFFFFFFF' indicating an un-updated null data condition. The second special null data value is a hexadecimal X'7FFFFFFF'. It is used to indicate that data will never be available for a variable for the orbit and sampling time, e.g., when an instrument was turned off during an orbit. All other values found in the data file can be interpreted as actual data.

The order of the instruments' variables' data and their formats in the records of the third file are listed below. Note that the first four bytes of a data record act as a key, giving the record's orbit and nominal time relative to periapsis. A brief description of each of the listed variables can be found in Attachment 2.

BYTES 001-004 KEY FIELD CONSISTING OF:
BYTES 001-002 BINARY ORBIT NUMBER
BYTES 003-004 BINARY 12 SECOND TIME INTERVAL -1800,-1788,...1788,1800
BYTES 005-008 AMV BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 009-012 ATTX BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 013-016 ATTY BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 017-020 ATTZ BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 021-024 BMAG BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT -12
BYTES 025-028 BXSC BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 029-032 BYSC BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 033-036 BZSC BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 037-040 COL BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 041-044 DA BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 045-048 DBTL BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 049-052 DBTR BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 053-056 DCO BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 057-060 DCO2 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 061-064 DHE BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 065-068 DH2 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 069-072 DN21 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 073-076 DO BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 077-080 DXP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 081-084 DYP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 085-088 DZP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 089-092 ELNE BELONGING TO THE OETP INSTR IN FLOATING PT FORMAT -01
BYTES 093-096 ELTE BELONGING TO THE OETP INSTR IN FLOATING PT FORMAT
BYTES 097-100 EMAG BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT -13
BYTES 101-104 ETEM BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT -07
BYTES 105-108 I001 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT -17
BYTES 109-112 I002 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 113-116 I004 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 117-120 I008 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 121-124 I012 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 125-128 I014 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 129-132 I016 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 133-136 I017 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 137-140 I018 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 141-144 I024 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 145-148 I028 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 149-152 I030 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 153-156 I032 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 157-160 I040 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 161-164 I044 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 165-168 I056 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 169-172 LATP BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 173-176 LONP BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 177-180 MAGR BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 181-184 MI BELONGING TO THE OETP INSTR IN FLOATING PT FORMAT
BYTES 185-188 MONE BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 189-192 MTWO BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 193-196 MVE BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT -15
BYTES 197-200 NA BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT -11
BYTES 201-204 NCO BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 205-208 NCO2 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT

BYTES 209-212 NHE BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 213-216 NH2 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 217-220 NN2 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 221-224 NO BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 225-228 NONE BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 229-232 NTOT BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 233-236 NTWO BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 237-240 NVR1 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 241-244 NVR2 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 245-248 NVR3 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 249-252 PPSP BELONGING TO THE OPA. INSTR IN FLOATING PT FORMAT
BYTES 253-256 PFLX BELONGING TO THE OPA INSTR IN FLOATING PT FORMAT
BYTES 257-260 RLAT BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT -02
BYTES 261-264 RLON BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 265-268 RRAD BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 269-272 RRHO BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 273-276 SHA BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 277-280 SHT BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 281-284 SLOP BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 285-288 SPIN BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 289-292 SPOT BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 293-296 SPR1 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 297-300 SPR2 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 301-304 SZA BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 305-308 TONE BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 309-312 TTWO BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 313-316 UTMS BELONGING TO THE SEDR INSTR IN FIXED DECIMLFORMAT
BYTES 317-320 UTYD BELONGING TO THE SEDR INSTR IN FIXED DECIMLFORMAT
BYTES 321-324 VES BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 325-328 VS BELONGING TO THE OETP. INSTR IN FLOATING PT FORMAT
BYTES 329-332 VVR1 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 333-336 VVR2 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 337-340 VVR3 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 341-344 WVL BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 345-348 XP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 349-352 XS1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 353-356 XVEL BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 357-360 YP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 361-364 YS1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 365-368 YVEL BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 369-372 ZP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 373-376 ZS1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 377-380 ZVEL BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 381-384 100H BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT
BYTES 385-388 31KH BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT
BYTES 389-392 54KH BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT
BYTES 393-396 730H BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT

Attachment C for LFD Tape 006

1

1 VARIABLE NAMES DICTIONARY FOR ORBITS 1 THROUGH 37

-VARIABLE	DESCRIPTION	UNITS	INST	LOC	DATA TY
0					
AMV	ALTITUDE OF MAX VOLUME EMISSION RATE	KM	OUVS	GCLO	FLOAT
ATTX	S/C ATTITUDE X COMPONENT	---	SEDR	PPO	FLOAT
ATTY	S/C ATTITUDE Y COMPONENT	---	SEDR	PPO	FLOAT
ATTZ	S/C ATTITUDE Z COMPONENT	---	SEDR	PPO	FLOAT
BMAG	MAGNITUDE OF MAGNETIC FIELD	GAMMAS	CMAG	UCLA	FLOAT
BXSC	X COMPONENT OF MAGNETIC FIELD	GAMMAS	CMAG	UCLA	FLOAT
BYSC	Y COMPONENT OF MAGNETIC FIELD	GAMMAS	CMAG	UCLA	FLOAT
BZSC	Z COMPONENT OF MAGNETIC FIELD	GAMMAS	CMAG	UCLA	FLOAT
COL	VERTICAL COLUMN EMISSION RATE	CM-2/SEC	OUVS	GCLO	FLOAT
DA	A NUMBER DENSITY/ERROR	PART/CC	ONMS	GSFC	FLOAT
DETL	DELTA /T/	GAMMAS	CMAG	UCLA	FLOAT
DETR	DELTA /TT/	GAMMAS	CMAG	UCLA	FLOAT
DO	O NUMBER DENSITY	PART/CC	ONMS	GSFC	FLOAT
DO2	O2 NUMBER DENSITY	PART/CC	ONMS	GSFC	FLOAT
DHE	HE NUMBER DENSITY	PART/CC	ONMS	GSFC	FLOAT
DH2	MOLECULAR HYDROGEN	---	ONMS	GSFC	FLOAT
DN2	N2 NUMBER DENSITY	PART/CC	ONMS	GSFC	FLOAT
DO	O NUMBER DENSITY	PART/CC	ONMS	GSFC	FLOAT
DXP1	VELOCITY VECTOR X COMPONENT	KM/SEC	SEDR	PPO	FLOAT
DYP1	VELOCITY VECTOR Y COMPONENT	KM/SEC	SEDR	PPO	FLOAT
DZP1	VELOCITY VECTOR Z COMPONENT	KM/SEC	SEDR	PPO	FLOAT
ELNE	PLASMA DENSITY	N/CC	OETP	GSFC	FLOAT
ELTE	ELECTRON TEMPERATURE	DEG K	OETP	GSFC	FLOAT
EMAG	MAGNITUDE OF ELECTRIC FIELD	GAUSS	CEFD	UCLA	FLOAT
ETEM	ELECTRON TEMPERATURE	K	OETA	LRC	FLOAT
IC01	NUMBER DENSITY OF H+	CM-3	ONMS	GSFC	FLOAT
IC02	NUMBER DENSITY OF He+,2+	CM-3	ONMS	GSFC	FLOAT
IC04	NUMBER DENSITY OF N+	CM-3	ONMS	GSFC	FLOAT
IC06	NUMBER DENSITY OF O++	CM-3	ONMS	GSFC	FLOAT
IC12	NUMBER DENSITY OF C+	CM-3	ONMS	GSFC	FLOAT
IC14	NUMBER DENSITY OF N+	CM-3	ONMS	GSFC	FLOAT
IC16	NUMBER DENSITY OF O+	CM-3	ONMS	GSFC	FLOAT
IC17	NUMBER DENSITY OF OH+	CM-3	ONMS	GSFC	FLOAT
IC18	NUMBER DENSITY OF H2O+	CM-3	ONMS	GSFC	FLOAT
IC24	NUMBER DENSITY OF N2+	CM-3	ONMS	GSFC	FLOAT
IC28	NUMBER DENSITY OF N2+,CO+	CM-3	ONMS	GSFC	FLOAT
IC30	NUMBER DENSITY OF NO+	CM-3	ONMS	GSFC	FLOAT
IC32	NUMBER DENSITY OF O2+	CM-3	ONMS	GSFC	FLOAT
IC40	NUMBER DENSITY OF AR+	CM-3	ONMS	GSFC	FLOAT
IC44	NUMBER DENSITY OF CO2+	CM-3	ONMS	GSFC	FLOAT
IC56	NUMBER DENSITY OF FE+	CM-3	ONMS	GSFC	FLOAT
LATI	VENUSIAN LATITUDE	DECIMES	SEDR	PPO	FLOAT
LONP	VENUSIAL LONGITUDE	DECREES	SEDR	PPO	FLOAT
RADI	RADIUS FROM CENTER OF VENUS TO S/C	KM	SEDR	PPO	FLOAT
MI	MEAN ION MASS	AMU	OETP	GSFC	FLOAT
MOLE	MASS OF ION 1	AMU	ORPA	LRSC	FLOAT
MIMO	MASS OF ION 2	AMU	ORPA	LRSC	FLOAT
MVE	MAXIMUM VOLUME EMISSION RATE	CM-3/SEC	OUVS	GCLO	FLOAT
NA	ARGON	---	ONMS	GSFC	FLOAT
NCO	CARBON MONOXIDE	---	ONMS	GSFC	FLOAT
NCO2	CARBON DIOXIDE	---	ONMS	GSFC	FLOAT
NHE	HELIUM	---	ONMS	GSFC	FLOAT

006-21

[illegible]	N2 NUMBER DENSITY/ERROR	PART/CC	ORMS	GSFC	FLOAT
	MOLECULAR NITROGEN	---	ORMS	GSFC	FLOAT
1	ATOMIC OXYGEN	---	ORMS	GSFC	FLOAT
	NUMBER DENSITY FOR ION 1	CM-3	ORPA	LMSC	FLOAT
	TOTAL ION DENSITY	CM-3	ORPA	LMSC	FLOAT
	NUMBER DENSITY FOR ION 2	CM-3	ORPA	LMSC	FLOAT
	VARIABLE 1	---	ORMS	GSFC	FLOAT
	VARIABLE 2	---	ORMS	GSFC	FLOAT
	VARIABLE 3	---	ORMS	GSFC	FLOAT
	SOLAR WIND PROTON BULK SPEED	KM/SEC	OPA	ARC	FLOAT
	SOLAR WIND PROTON FLUX	# CM-2/SEC	OPA	ARC	FLOAT
	BODY-FIXED LATITUDE OF RADAR FOOTPRINT	DEG.	ORAD	MIT	FLOAT
	BODY-FIXED LONGITUDE OF RADAR FOOTPRINT	DEG.	ORAD	MIT	FLOAT
	PLANETARY RADIUS RELATIVE TO 6051.2 KM	KM	ORAD	MIT	FLOAT
	RADAR REFLECTIVITY AT 17 CM WAVELENGTH	----	ORAD	MIT	FLOAT
	SOLAR HOUR ANGLE	DEGREES	SEDR	PPO	FLOAT
	SCALE HEIGHT	KM	OUVS	GGLG	FLOAT
	RMS SURFACE SLOPE AT 1 METER SCALE	DEG.	ORAD	MIT	FLOAT
	SPIN PERIOD	SEC (DEG)	SEDR	PPO	FLOAT
	SPACECRAFT POTENTIAL	VOLTS	ORPA	LMSC	FLOAT
	TED	---	ORMS	GSFC	FLOAT
	TED	---	ORMS	GSFC	FLOAT
	SOLAR ZENITH ANGLE	DEGREES	SEDR	PPO	FLOAT
	TEMPERATURE OF ION 1	K	ORPA	LMSC	FLOAT
	TEMPERATURE OF ION 2	K	ORPA	LMSC	FLOAT
	UNIVERSAL TIME (TIME)	MS (BIN)	SEDR	PPO	FIXED
	UNIVERSAL TIME (YEAR,DAY)	MS (BIN)	SEDR	PPO	FIXED
	VOLUME EMISSION RATE AT S/C	CM-3/SEC	OUVS	GGLG	FLOAT
	SPACECRAFT POTENTIAL	VOLTS	OETP	GSFC	FLOAT
	VARIABLE 1 VALUE	---	ORMS	GSFC	FLOAT
	VARIABLE 2 VALUE	---	ORMS	GSFC	FLOAT
	VARIABLE 3 VALUE	---	ORMS	GSFC	FLOAT
	WAVELENGTH	ANGSTROMS	OUVS	GGLG	FLOAT
	POSITIONAL VECTOR X COMPONENT	KM	SEDR	PPO	FLOAT
	SUN POSITION X COMPONENT	KM	SEDR	PPO	FLOAT
	X COMPONENT OF ION DRIFT VELOCITY	M/SEC	ORPA	LMSC	FLOAT
	POSITIONAL VECTOR Y COMPONENT	KM	SEDR	PPO	FLOAT
	SUN POSITION Y COMPONENT	KM	SEDR	PPO	FLOAT
	Y COMPONENT OF ION DRIFT VELOCITY	M/SEC	ORPA	LMSC	FLOAT
	POSITIONAL VECTOR Z COMPONENT	KM	SEDR	PPO	FLOAT
	SUN POSITION Z COMPONENT	KM	SEDR	PPO	FLOAT
	Z COMPONENT OF ION DRIFT VELOCITY	M/SEC	ORPA	LMSC	FLOAT
	FREQUENCY CHANNEL CENTERED AT 100HZ	---	OEFD	UCLA	FLOAT
	FREQUENCY CHANNEL CENTERED AT 31KHZ	---	OEFD	UCLA	FLOAT
	FREQUENCY CHANNEL CENTERED AT 5.4KHZ	---	OEFD	UCLA	FLOAT
	FREQUENCY CHANNEL CENTERED AT 730HZ	---	OEFD	UCLA	FLOAT

1 VARIABLE NAMES DICTIONARY FOR ORBITS 1 THROUGH 37

VARIABLE	DESCRIPTION	UNITS	INST	LOC	DATA TY
	MAGNITUDE OF ELECTRIC FIELD	GAUSS	OEFD	UCLA	FLOAT
	FREQUENCY CHANNEL CENTERED AT 100HZ	---	OEFD	UCLA	FLOAT
	FREQUENCY CHANNEL CENTERED AT 31KHZ	---	OEFD	UCLA	FLOAT
	FREQUENCY CHANNEL CENTERED AT 5.4KHZ	---	OEFD	UCLA	FLOAT
	FREQUENCY CHANNEL CENTERED AT 730HZ	---	OEFD	UCLA	FLOAT
	PLASMA DENSITY	N/CC	OETP	GSFC	FLOAT
	ELECTRON TEMPERATURE	DEG K	OETP	GSFC	FLOAT
	MEAN ION MASS	AMU	OETP	GSFC	FLOAT
	SPACECRAFT POTENTIAL	VOLTS	OETP	GSFC	FLOAT

	IC01	NUMBER DENSITY OF H+	CM-3	OINS	GSFC FLOAT
	IC02	NUMBER DENSITY OF H2+,D+	CM-3	OINS	GSFC FLOAT
	IC04	NUMBER DENSITY OF HE+	CM-3	OINS	GSFC FLOAT
	IC06	NUMBER DENSITY OF O++	CM-3	OINS	GSFC FLOAT
	IC12	NUMBER DENSITY OF C+	CM-3	OINS	GSFC FLOAT
	IC14	NUMBER DENSITY OF N+	CM-3	OINS	GSFC FLOAT
	IC16	NUMBER DENSITY OF O+	CM-3	OINS	GSFC FLOAT
	IC17	NUMBER DENSITY OF OH+	CM-3	OINS	GSFC FLOAT
	IC18	NUMBER DENSITY OF H2O+	CM-3	OINS	GSFC FLOAT
	IC24	NUMBER DENSITY OF NO+	CM-3	OINS	GSFC FLOAT
	IC28	NUMBER DENSITY OF N2+,CO+	CM-3	OINS	GSFC FLOAT
	IC30	NUMBER DENSITY OF NO+	CM-3	OINS	GSFC FLOAT
	IC32	NUMBER DENSITY OF O2+	CM-3	OINS	GSFC FLOAT
	IC40	NUMBER DENSITY OF AR+	CM-3	OINS	GSFC FLOAT
	IC44	NUMBER DENSITY OF CO2+	CM-3	OINS	GSFC FLOAT
	IC56	NUMBER DENSITY OF FE+	CM-3	OINS	GSFC FLOAT
	SPR1	TBD	---	OINS	GSFC FLOAT
	SPR2	TBD	---	OINS	GSFC FLOAT
	BMAG	MAGNITUDE OF MAGNETIC FIELD	GAMMAS	OMAG	UCLA FLOAT
	BXSC	X COMPONENT OF MAGNETIC FIELD	GAMMAS	OMAG	UCLA FLOAT
	BYSC	Y COMPONENT OF MAGNETIC FIELD	GAMMAS	OMAG	UCLA FLOAT
	BZSC	Z COMPONENT OF MAGNETIC FIELD	GAMMAS	OMAG	UCLA FLOAT
	DELB	DELTA /B/	GAMMAS	OMAG	UCLA FLOAT
	DELI	DELTA /I/	GAMMAS	OMAG	UCLA FLOAT
	IA	A NUCLEI DENSITY/ERROR	PART/CC	OINS	GSFC FLOAT
	ICO	CO NUMBER DENSITY	PART/CC	OINS	GSFC FLOAT
	ICO2	CO2 NUMBER DENSITY	PART/CC	OINS	GSFC FLOAT
	IHE	HE NUMBER DENSITY	PART/CC	OINS	GSFC FLOAT
	IH2	MOLECULAR HYDROGEN	---	OINS	GSFC FLOAT
	IN	N+ NUMBER DENSITY	PART/CC	OINS	GSFC FLOAT
	IO	O NUMBER DENSITY	PART/CC	OINS	GSFC FLOAT
	IX	ISCOM	---	OINS	GSFC FLOAT
	MCO	CARBON MONOXIDE	---	OINS	GSFC FLOAT
	MCO2	CARBON DIOXIDE	---	OINS	GSFC FLOAT
	MHE	HELIUM	---	OINS	GSFC FLOAT
	MN2	N2 NUMBER DENSITY/ERROR	PART/CC	OINS	GSFC FLOAT
	MH2	MOLECULAR NITROGEN	---	OINS	GSFC FLOAT
	MO	ATOMIC OXYGEN	---	OINS	GSFC FLOAT
	MVR1	VARIABLE 1	---	OINS	GSFC FLOAT
	MVR2	VARIABLE 2	---	OINS	GSFC FLOAT
	MVR3	VARIABLE 3	---	OINS	GSFC FLOAT
	VVR1	VARIABLE 1 VALUE	---	OINS	GSFC FLOAT
	VVR2	VARIABLE 2 VALUE	---	OINS	GSFC FLOAT
	VVR3	VARIABLE 3 VALUE	---	OINS	GSFC FLOAT
	PLSP	SOLAR WIND PROTON BULK SPEED	KM/SEC	OPA	ARC FLOAT
1	PFLX	SOLAR WIND PROTON FLUX	# CM-2/SEC	OPA	ARC FLOAT
	PLAT	BODY-FIXED LATITUDE OF RADAR FOOTPRINT	DEG.	ORAD	MIT FLOAT
	PLON	BODY-FIXED LONGITUDE OF RADAR FOOTPRINT	DEG.	ORAD	MIT FLOAT
	RPAD	PLANETARY RADIUS RELATIVE TO 6051.2 KM	KM	ORAD	MIT FLOAT
	REFC	RADAR REFLECTIVITY AT 17 CM WAVELENGTH	----	ORAD	MIT FLOAT
	SLOP	INS SURFACE SLOPE AT 1 METER SCALE	DEG.	ORAD	MIT FLOAT
	ETEM	ELECTRON TEMPERATURE	K	ORPA	LMSC FLOAT
	MONE	MASS OF ION 1	AMU	ORPA	LMSC FLOAT
	MTWO	MASS OF ION 2	AMU	ORPA	LMSC FLOAT
	NONE	NUMBER DENSITY FOR ION 1	CM-3	ORPA	LMSC FLOAT
	NTOT	TOTAL ION DENSITY	CM-3	ORPA	LMSC FLOAT
	NTWO	NUMBER DENSITY FOR ION 2	CM-3	ORPA	LMSC FLOAT
	SPOT	SPACECRAFT POTENTIAL	VOLTS	ORPA	LMSC FLOAT

TONE	[illegible] OF ION 1	K	ORPA	[illegible]	FLOAT
TTWO	TEMPERATURE OF ION 2	K	ORPA	[illegible]	FLOAT
XVEL	X COMPONENT OF ION DRIFT VELOCITY	M/SEC	ORPA	[illegible]	FLOAT
YVEL	Y COMPONENT OF ION DRIFT VELOCITY	M/SEC	ORPA	[illegible]	FLOAT
ZVEL	Z COMPONENT OF ION DRIFT VELOCITY	M/SEC	ORPA	[illegible]	FLOAT
ALV	ALTITUDE OF MAX VOLUME EMISSION RATE	KM	OUVS	COLO	FLOAT
COL	VERTICAL COLUMN EMISSION RATE	CM-2/SEC	OUVS	COLO	FLOAT
MVE	MAXIMUM VOLUME EMISSION RATE	CM-3/SEC	OUVS	COLO	FLOAT
SHT	SCALE HEIGHT	KM	OUVS	COLO	FLOAT
VES	VOLUME EMISSION RATE AT S/C	CM-3/SEC	OUVS	COLO	FLOAT
WVL	WAVELENGTH	ANGSTROMS	OUVS	COLO	FLOAT
ATTX	S/C ATTITUDE X COMPONENT	---	SEDR	PPO	FLOAT
ATTY	S/C ATTITUDE Y COMPONENT	---	SEDR	PPO	FLOAT
ATTZ	S/C ATTITUDE Z COMPONENT	---	SEDR	PPO	FLOAT
DXP1	VELOCITY VECTOR X COMPONENT	KM/SEC	SEDR	PPO	FLOAT
DYP1	VELOCITY VECTOR Y COMPONENT	KM/SEC	SEDR	PPO	FLOAT
DZP1	VELOCITY VECTOR Z COMPONENT	KM/SEC	SEDR	PPO	FLOAT
LATP	VENUSIAL LATITUDE	DEGREES	SEDR	PPO	FLOAT
LONP	VENUSIAN LONGITUDE	DEGREES	SEDR	PPO	FLOAT
RADR	RADIUS FROM CENTER OF VENUS TO S/C	KM	SEDR	PPO	FLOAT
SDA	SOLAR DOOR ANGLE	DEGREES	SEDR	PPO	FLOAT
SPIN	SPIN PERIOD	SEC (SEC)	SEDR	PPO	FLOAT
SZA	SOLAR ZENITH ANGLE	DEGREES	SEDR	PPO	FLOAT
UTMS	UNIVERSAL TIME (TIME)	MS (DIN)	SEDR	PPO	FIXED
UTYD	UNIVERSAL TIME (YEAR,DAY)	MS (DIN)	SEDR	PPO	FIXED
XP1	POSITIONAL VECTOR X COMPONENT	KM	SEDR	PPO	FLOAT
XS1	SUN POSITION X COMPONENT	KM	SEDR	PPO	FLOAT
YP1	POSITIONAL VECTOR Y COMPONENT	KM	SEDR	PPO	FLOAT
YS1	SUN POSITION Y COMPONENT	KM	SEDR	PPO	FLOAT
ZP1	POSITIONAL VECTOR Z COMPONENT	KM	SEDR	PPO	FLOAT
ZS1	SUN POSITION Z COMPONENT	KM	SEDR	PPO	FLOAT

M; T=0.43/1.21 09:18:32

C>
C>
C>
C>
C>
C>
C>
C>
C>

006 - 2.4

FORMAT OF PIONEER 12 LOW FREQUENCY DATA (LFD) TAPE 007

The Pioneer Venus Low Frequency Data Tape 007 contains the Pioneer Venus orbiting spacecraft's processed Low Frequency Data for Orbits 38 through 162. The data has been recorded on a 9-track tape at a 800 bpi density. Since this tape was created on an IBM machine, the EBCDIC character set and IBM floating point number format were used where applicable. There are three files on this tape. Each file is followed by a single end-of-file mark. These files in the order of their occurrence are:

FILE 1 - TAPE DESCRIPTION FILE

This file consists of 120 80-character records. Its purpose is to provide a readily available description of the data contained in the tape's second and third files. The file is blocked one logical record per physical record and is wholly comprised of printable EBCDIC characters. See Attachment 1 for a printed copy of this file's contents.

FILE 2 - STATUS FILE

This file consists of 125 266-character records. There is one record for each of the 125 orbits included on this tape. All data is in EBCDIC, printable characters. The data included in each record is as follows:

Bytes	Data	Format	
1-4	Number of orbit described by this record	dddd	4 char
5-10	Date of orbit	yy:DOY	6 char
11-22	UT start time of data included for orbit	HH:MM:SS.MIL	12 char
23-34	UT stop time of data included for orbit	HH:MM:SS.MIL	12 char
35-46	UT of orbit's periapsis	HH:MM:SS.MIL	12 char
47-50	Name of instrument 1	aaaa	4 char
51-52	Number of variables for instrument 1	dd	2 char
53-60	Last date data entered for instrument 1-orbit	MM/DD/YY	8 char
61-64	Total amount of data for instrument 1 for orbit	dddd	4 char
65-68	Total number of instances of "no data avail" for instrument 1 for orbit	dddd	4 char
69-72	Name of instrument 2	aaaa	4 char
73-74	Number of variables for instrument 2	dd	2 char
75-82	Last date data entered for instrument 2-orbit	MM/DD/YY	8 char

83-86	Total amount of data for instrument 2 for orbit	dddd	4 char
87-90	Total number of instances of "no data avail" for instrument 2 for orbit	dddd	4 char
91-94	Name of instrument 3	aaaa	4 char
95-96	Number of variables for instrument 3	dd	2 char
97-104	Last date data entered for instrument 3-orbit	MM/DD/YY	8 char
105-108	Total amount of data for instrument 3 for orbit	dddd	4 char
109-112	Total number of instances of "no data avail" for instrument 3 for orbit	dddd	4 char
113-116	Name of instrument 4	aaaa	4 char
117-118	Number of variables for instrument 4	dd	2 char
119-126	Last date data entered for instrument 4-orbit	MM/DD/YY	8 char
127-130	Total amount of data for instrument 4 for orbit	dddd	4 char
131-134	Total number of instances of "no data avail" for instrument 4 for orbit	dddd	4 char
135-138	Name of instrument 5	aaaa	4 char
139-140	Number of variables for instrument 5	dd	2 char
141-148	Last date data entered for instrument 5-orbit	MM/DD/YY	8 char
149-152	Total amount of data for instrument 5 for orbit	dddd	4 char
153-156	Total number of instances of "no data avail" for instrument 5 for orbit	dddd	4 char
157-160	Name of instrument 6	aaaa	4 char
161-162	Number of variables for instrument 6	dd	2 char
163-170	Last date data entered for instrument 6-orbit	MM/DD/YY	8 char
171-174	Total amount of data for instrument 6 for orbit	dddd	4 char
175-178	Total number of instances of "no data avail" for instrument 6 for orbit	dddd	4 char
179-182	Name of instrument 7	aaaa	4 char
183-184	Number of variables for instrument 7	dd	2 char

185-192	Last date data entered for instrument 7-orbit	MM/DD/YY	8 char
193-196	Total amount of data for instrument 7 for orbit	dddd	4 char
197-200	Total number of instances of "no data avail" for instrument 7 for orbit	dddd	4 char
201-204	Name of instrument 8	aaaa	4 char
205-206	Number of variables for instrument 8	dd	2 char
207-214	Last date data entered for instrument 8-orbit	MM/DD/YY	8 char
215-218	Total amount of data for instrument 8 for orbit	dddd	4 char
219-222	Total number of instances of "no data avail" for instrument 8 for orbit	dddd	4 char
223-226	Name of instrument 9	aaaa	4 char
227-228	Number of variables for instrument 9	dd	2 char
229-236	Last date data entered for instrument 9-orbit	MM/DD/YY	8 char
237-240	Total amount of data for instrument 9 for orbit	dddd	4 char
241-244	Total number of instances of "no data avail" for instrument 9 for orbit	dddd	4 char
245-248	Name of instrument 10	aaaa	4 char
249-250	Number of variables for instrument 10	dd	2 char
251-258	Last date data entered for instrument 10-orbit	MM/DD/YY	8 char
259-262	Total amount of data for instrument 10	dddd	4 char
263-266	Total number of instances of "no data avail" for instrument 10 for orbit	dddd	4 char

FILE 3 - DATA FILE

This file consists of 37,625 376-byte logical records. The logical records are packed ten to a physical record. There are 301 logical records for each of the 125 orbits. These records contain the processed orbital data centered around periapsis sampled at approximately 12-second intervals.

Logical records 1 through 301, inclusive, contain the data for orbit 38. Logical records 302 through 602, inclusive, contain the data for orbit 39, etc.

The first logical record for each orbit contains the data for all of the instruments' variables sampled at the UT start time specified for the orbit in its status record (File 2). The orbit's second logical record contains the instruments' variables' data sampled 12 seconds after the UT start time. The

orbit's third logical record contains the instruments' variables' data sampled 24 seconds after the UT time, etc. The one hundred and fifty-first logical record for an orbit contains the variables' data sampled at the time of periapsis, as specified in the orbit's status record. Due to the characteristics of the available unprocessed data, there may not exist a 12 second interval between the sampling times of the periapsis data in logical record 151 and the data in logical records 150 and 152 for an orbit. However, there will be 12 second intervals between the sampling times of the data in an orbit's records 152 through 301. Therefore, the sampling time of each of an orbit's records may be calculated from the UT start, UT periapsis, and UT stop times in the orbit's status record. It is also available in each record's UTMS and UTYD variables.

Two special values were reserved to indicate the two possible null data conditons. When the LFD data base was initialized, all of the variables' values were set to hexadecimal X'FFFFFFFF' indicating an un-updated null data condition. The second special null data value is a hexadecimal X'7FFFFFFF'. It is used to indicate that data will never be available for a variable for the orbit and sampling time, e.g., when an instrument was turned off during an orbit. All other values found in the data file can be interpreted as actual data.

The order of the instruments' variables' data and their formats in the records of the third file are listed below. Note that the first four bytes of a data record act as a key, giving the record's orbit and nominal time relative to periapsis. A brief description of each of the listed variables can be found in Attachment 2.

BYTES 001-004 KEY FIELD CONSISTING OF:
BYTES 001-002 BINARY ORBIT NUMBER
BYTES 003-004 BINARY 12 SECOND TIME INTERVAL -1800,-1788,...1788,1800
BYTES 005-008 AMV BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 009-012 ATTX BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 013-016 ATTY BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 017-020 ATTZ BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 021-024 BMAG BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 025-028 BXSC BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 029-032 BYSC BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 033-036 BZSC BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 037-040 COL BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 041-044 DBTL BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 045-048 DBTR BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 049-052 DCO BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 053-056 DCO2 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 057-060 DHE BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 061-064 DN2 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 065-068 DO BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 069-072 DXP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 073-076 DYP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 077-080 DZP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 081-084 ELNE BELONGING TO THE OETP INSTR IN FLOATING PT FORMAT
BYTES 085-088 ELTE BELONGING TO THE OETP INSTR IN FLOATING PT FORMAT
BYTES 089-092 EMAG BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT
BYTES 093-096 ETEM BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 097-100 I001 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 101-104 I002 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 105-108 I004 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 109-112 I008 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 113-116 I012 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 117-120 I014 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 121-124 I016 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 125-128 I017 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 129-132 I018 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 133-136 I024 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 137-140 I028 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 141-144 I030 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 145-148 I032 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 149-152 I040 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 153-156 I044 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 157-160 I056 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 161-164 LATP BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 165-168 LONP BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 169-172 MAGR BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 173-176 MI BELONGING TO THE OETP INSTR IN FLOATING PT FORMAT
BYTES 177-180 MONE BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 181-184 MTWO BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 185-188 MVE BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 189-192 NONE BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 193-196 NTOT BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 197-200 NTWO BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 201-204 NVR1 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 205-208 NVR2 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT

BYTES 209-212 NVR3 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 213-216 NVR4 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 217-220 NVR5 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 221-224 PBSP BELONGING TO THE OPA INSTR IN FLOATING PT FORMAT
BYTES 225-228 PFLX BELONGING TO THE OPA INSTR IN FLOATING PT FORMAT
BYTES 229-232 RLAT BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 233-236 RLON BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 237-240 RRAD BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 241-244 RRHO BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 245-248 SHA BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 249-252 SHT BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 253-256 SLOP BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 257-260 SPIN BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 261-264 SPOT BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 265-268 SPR1 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 269-272 SPR2 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 273-276 SZA BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 277-280 TONE BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 281-284 TTWO BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 285-288 UTMS BELONGING TO THE SEDR INSTR IN FIXED DECIMLFORMAT
BYTES 289-292 UTYD BELONGING TO THE SEDR INSTR IN FIXED DECIMLFORMAT
BYTES 293-296 VES BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 297-300 VS BELONGING TO THE OETP INSTR IN FLOATING PT FORMAT
BYTES 301-304 VVR1 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 305-308 VVR2 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 309-312 VVR3 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 313-316 VVR4 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 317-320 VVR5 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 321-324 WVL BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 325-328 XP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 329-332 XS1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 333-336 XVEL BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 337-340 YP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 341-344 YS1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 345-348 YVEL BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 349-352 ZP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 353-356 ZS1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 357-360 ZVEL BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 361-364 100H BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT
BYTES 365-368 31KH BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT
BYTES 369-372 54KH BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT
BYTES 373-376 730H BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT

Attachment 2

1 VARIABLE NAMES DICTIONARY FOR ORBITS 38 THROUGH 274

-VARIABLE	DESCRIPTION	UNITS	INST	LOC	DATA
0					
ANV	[illegible]	KM	OUVS	COLO	FLOAT
ATTX	S/C ATTITUDE X COMPONENT	---	SEDR	PPO	FLOAT
ATTY	S/C ATTITUDE Y COMPONENT	---	SEDR	PPO	FLOAT
ATTZ	S/C ATTITUDE Z COMPONENT	---	SEDR	PPO	FLOAT
BMAG	MAGNITUDE OF MAGNETIC FIELD	GAMMAS	ONAG	UCLA	FLOAT
BXSC	X COMPONENT OF MAGNETIC FIELD	GAMMAS	ONAG	UCLA	FLOAT
BYSC	Y COMPONENT OF MAGNETIC FIELD	GAMMAS	ONAG	UCLA	FLOAT
BZSC	Z COMPONENT OF MAGNETIC FIELD	GAMMAS	ONAG	UCLA	FLOAT
CVI	[illegible]	CM-2/SEC	OUVS	COLO	FLOAT
DFIL	[illegible]	CM/S	ONAG	UCLA	FLOAT
DPAR	[illegible]	CM/AP	ONAG	UCLA	FLOAT
HO	[illegible]	PART/CC	ONMS	GSFC	FLOAT
HE	[illegible]	PART/CC	ONMS	GSFC	FLOAT
N	[illegible]	PART/CC	ONMS	GSFC	FLOAT
O	O NUMBER DENSITY	PART/CC	ONMS	GSFC	FLOAT
OXP1	VELOCITY VECTOR X COMPONENT	KM/SEC	SEDR	PPO	FLOAT
OYP1	VELOCITY VECTOR Y COMPONENT	KM/SEC	SEDR	PPO	FLOAT
OZP1	VELOCITY VECTOR Z COMPONENT	KM/SEC	SEDR	PPO	FLOAT
ELNE	PLASMA DENSITY	E/CC	OETP	GSFC	FLOAT
ELTE	ELECTRON TEMPERATURE	DEG K	OETP	GSFC	FLOAT
EMAG	MAGNITUDE OF ELECTRIC FIELD	CM/SEC	OEFD	UCLA	FLOAT
ETEM	ELECTRON TEMPERATURE	K	ORPA	LMSC	FLOAT
IO01	NUMBER DENSITY OF H+	CM-3	OIMS	GSFC	FLOAT
IO02	NUMBER DENSITY OF He+,3+	CM-3	OIMS	GSFC	FLOAT
IO04	NUMBER DENSITY OF HN4	CM-3	OIMS	GSFC	FLOAT
IO09	NUMBER DENSITY OF O4+	CM-3	OIMS	GSFC	FLOAT
IO12	NUMBER DENSITY OF O+	CM-3	OIMS	GSFC	FLOAT
IO14	NUMBER DENSITY OF N+	CM-3	OIMS	GSFC	FLOAT
IO16	NUMBER DENSITY OF O+	CM-3	OIMS	GSFC	FLOAT
IO17	NUMBER DENSITY OF OH+	CM-3	OIMS	GSFC	FLOAT
IO18	NUMBER DENSITY OF H2O+	CM-3	OIMS	GSFC	FLOAT
IO24	NUMBER DENSITY OF NO+	CM-3	OIMS	GSFC	FLOAT
IO28	NUMBER DENSITY OF N2+,CO+	CM-3	OIMS	GSFC	FLOAT
IO30	NUMBER DENSITY OF NO+	CM-3	OIMS	GSFC	FLOAT
IO32	NUMBER DENSITY OF O2+	CM-3	OIMS	GSFC	FLOAT
IO40	NUMBER DENSITY OF AR+	CM-3	OIMS	GSFC	FLOAT
IO44	NUMBER DENSITY OF CO2+	CM-3	OIMS	GSFC	FLOAT
IO50	NUMBER DENSITY OF N2O+	CM-3	OIMS	GSFC	FLOAT
LATP	VERUSIAN LATITUDE	DEGREES	SEDR	PPO	FLOAT
LONT	VERUSIAN LONGITUDE	DEGREES	SEDR	PPO	FLOAT
MACH	MACHOS FLOW CENTER TO VEHICLE TO S/C	KM	SEDR	PPO	FLOAT
MI	MEAN ION MASS	AMU	OETP	GSFC	FLOAT
MONE	MASS OF ION 1	AMU	ORPA	LMSC	FLOAT
MTWO	MASS OF ION 2	AMU	ORPA	LMSC	FLOAT
NVE	MAXIMUM VOLUME EMISSION RATE	CM-3/SEC	OUVS	COLO	FLOAT
NONE	NUMBER DENSITY FOR ION 1	CM-3	ORPA	LMSC	FLOAT
NTOT	TOTAL ION DENSITY	CM-3	ORPA	LMSC	FLOAT
NTWO	NUMBER DENSITY FOR ION 2	CM-3	ORPA	LMSC	FLOAT
NVR1	VARIABLE 1	---	ONMS	GSFC	FLOAT
NVR2	VARIABLE 2	---	ONMS	GSFC	FLOAT
NVR3	VARIABLE 3	---	ONMS	GSFC	FLOAT

007-2.1

	[illegible]	---		[illegible]	
	KVR5 VARIABLE 5	---		OINS GSFC	FLOAT
1	PBSP SOLAR WIND PROTON FLUX STEP	KM/SEC		OPA ARC	FLOAT
	PFLX SOLAR WIND PROTON FLUX	# CM-2/SEC		OPA ARC	FLOAT
	RLAT BODY-FIXED LATITUDE OF SUBSAT FOOTPRINT	DEG.		ORAD MIT	FLOAT
	RLON BODY-FIXED LONGITUDE OF SUBSAT FOOTPRINT	DEG.		ORAD MIT	FLOAT
	RRAD PLANETARY RADIUS RELATIVE TO 6051.2 KM	KM		ORAD MIT	FLOAT
	RRLO SOLAR REFLECTIVITY AT [illegible] WAVELENGTH	----		ORAD MIT	FLOAT
	SHA SOLAR HOUR ANGLE	DEGREES		SEDR PPO	FLOAT
	SHT SCALE HEIGHT	KM		OUVS COLO	FLOAT
	SLOP [illegible] SURFACE SLOPE AT [illegible] KM SCALE	DEG.		ORAD MIT	FLOAT
	SPIN SPIN PERIOD	SEC (DEC)		SEDR PPO	FLOAT
	SPOT SPACECRAFT POTENTIAL	VOLTS		ORPA LMSC	FLOAT
	SPR1 [illegible]	---		OINS GSFC	FLOAT
	SPR2 [illegible]	---		OINS GSFC	FLOAT
	SZA SOLAR ZENITH ANGLE	DEGREES		SEDR PPO	FLOAT
	[illegible] [illegible] OF ION 1	%		ORPA LMSC	FLOAT
	[illegible] [illegible] OF ION 2	%		ORPA LMSC	FLOAT
	UIMS UNIQUE ID [illegible] (UIDS)	ID (LIN)		SEDR PPO	FIXED
	UTYD [illegible] TIME (UTC1,UTC2)	ID (PIL)		SEDR PPO	FIXED
	VEL [illegible]	CM-3/SEC		OUVS COLO	FLOAT
	VS SPACECRAFT POTENTIAL	VOLTS		OETP GSFC	FLOAT
	VVL1 VARIABLE 1 VALUE	---		OINS GSFC	FLOAT
	VVR2 VARIABLE 2 VALUE	---		OINS GSFC	FLOAT
	VVR3 VARIABLE 3 VALUE	---		OINS GSFC	FLOAT
	VVR4 VARIABLE 4 VALUE	---		OINS GSFC	FLOAT
	VVR5 VARIABLE 5 VALUE	---		OINS GSFC	FLOAT
	WVL WAVELENGTH	ANGSTROMS		OUVS COLO	FLOAT
	XP1 POSITIONAL VECTOR X COMPONENT	KM		SEDR PPO	FLOAT
	XS1 SUN POSITION X COMPONENT	KM		SEDR PPO	FLOAT
	XVEL X COMPONENT OF ION DRIFT VELOCITY	M/SEC		ORPA LMSC	FLOAT
	YP1 POSITIONAL VECTOR Y COMPONENT	KM		SEDR PPO	FLOAT
	YS1 SUN POSITION Y COMPONENT	KM		SEDR PPO	FLOAT
	YVEL Y COMPONENT OF ION DRIFT VELOCITY	M/SEC		ORPA LMSC	FLOAT
	ZP1 POSITIONAL VECTOR Z COMPONENT	KM		SEDR PPO	FLOAT
	ZS1 SUN POSITION Z COMPONENT	KM		SEDR PPO	FLOAT
	ZVEL Z COMPONENT OF ION DRIFT VELOCITY	M/SEC		ORPA LMSC	FLOAT
	100H FREQUENCY CHANNEL CENTERED AT 100HZ	---		OEFD UCLA	FLOAT
	31KH FREQUENCY CHANNEL CENTERED AT 31KHZ	---		OEFD UCLA	FLOAT
	54KH FREQUENCY CHANNEL CENTERED AT 54KHZ	---		OEFD UCLA	FLOAT
	730H FREQUENCY CHANNEL CENTERED AT 730HZ	---		OEFD UCLA	FLOAT

1 VARIABLE NAMES DICTIONARY FOR UNITS 30 THROUGH 274

-VARIABLE	DESCRIPTION	UNITS	INST	LOC	DATA
0					
EMAG	MAGNETUDE OF ELECTRIC FIELD	GAUSS	OEFD	UCLA	FLOAT
100H	FREQUENCY CHANNEL CENTERED AT 100HZ	---	OEFD	UCLA	FLOAT
31KH	FREQUENCY CHANNEL CENTERED AT 31KHZ	---	OEFD	UCLA	FLOAT
54KH	FREQUENCY CHANNEL CENTERED AT 54KHZ	---	OEFD	UCLA	FLOAT
730H	FREQUENCY CHANNEL CENTERED AT 730HZ	---	OEFD	UCLA	FLOAT
ELDE	[illegible] DENSITY	M/CC	OETP	GSFC	FLOAT
ELTT	ELECTRON TEMPERATURE	DEG K	OETP	GSFC	FLOAT
MI	MEAN ION MASS	AMU	OETP	GSFC	FLOAT
VS	SPACECRAFT POTENTIAL	VOLTS	OETP	GSFC	FLOAT
IO01	NUMBER DENSITY OF H+	CM-3	OINS	GSFC	FLOAT
IO02	NUMBER DENSITY OF H2+,O+	CM-3	OINS	GSFC	FLOAT
IO04	NUMBER DENSITY OF HE+	CM-3	OINS	GSFC	FLOAT
IO08	NUMBER DENSITY OF O++	CM-3	OINS	GSFC	FLOAT
IO12	NUMBER DENSITY OF O+	CM-3	OINS	GSFC	FLOAT

			CM-3	OIMS	GSFC FLOAT
	IO16	NUMBER DENSITY OF O+	CM-3	OIMS	GSFC FLOAT
	IO17	NUMBER DENSITY OF N+	CM-3	OIMS	GSFC FLOAT
	IO18	NUMBER DENSITY OF H2O+	CM-3	OIMS	GSFC FLOAT
	IO24	NUMBER DENSITY OF NO+	CM-3	OIMS	GSFC FLOAT
	IO28	NUMBER DENSITY OF N2+,CO+	CM-3	OIMS	GSFC FLOAT
	IO30	NUMBER DENSITY OF NO+	CM-3	OIMS	GSFC FLOAT
	IO32	NUMBER DENSITY OF O2+	CM-3	OIMS	GSFC FLOAT
	IO40	NUMBER DENSITY OF AR+	CM-3	OIMS	GSFC FLOAT
	IO44	NUMBER DENSITY OF CO2+	CM-3	OIMS	GSFC FLOAT
	IO56	NUMBER DENSITY OF FE+	CM-3	OIMS	GSFC FLOAT
	SPR1	TBD	---	OIMS	GSFC FLOAT
	SPR2	TBD	---	OIMS	GSFC FLOAT
	BMAG	MAGNITUDE OF MAGNETIC FIELD	GAMMAS	OMAG	UCLA FLOAT
	BXSC	X COMPONENT OF MAGNETIC FIELD	GAMMAS	OMAG	UCLA FLOAT
	BYSC	Y COMPONENT OF MAGNETIC FIELD	GAMMAS	OMAG	UCLA FLOAT
	BZSC	Z COMPONENT OF MAGNETIC FIELD	GAMMAS	OMAG	UCLA FLOAT
	DELL	DELTA /L/	GAMMAS	OMAG	UCLA FLOAT
	DLTV	DELTA /LV/	GAMMAS	OMAG	UCLA FLOAT
	DCC	CO [illegible] DENSITY	PART/CC	OMMS	GSFC FLOAT
	DCC2	CO2 [illegible] DENSITY	PART/CC	OMMS	GSFC FLOAT
	DHE	[illegible] DENSITY	PART/CC	OMMS	GSFC FLOAT
	DH2	[illegible] DENSITY	PART/CC	OMMS	GSFC FLOAT
	DO	[illegible] DENSITY	PART/CC	OMMS	GSFC FLOAT
	UVR1	[illegible] 1	---	OMMS	GSFC FLOAT
	UVR2	[illegible] 2	---	OMMS	GSFC FLOAT
	UVR3	[illegible] 3	---	OMMS	GSFC FLOAT
	UVR4	[illegible] 4	---	OMMS	GSFC FLOAT
	UVR5	[illegible] 5	---	OMMS	GSFC FLOAT
	VVR1	[illegible] 1 VALUE	---	OMMS	GSFC FLOAT
	VVR2	[illegible] 2 VALUE	---	OMMS	GSFC FLOAT
	VVR3	[illegible] 3 VALUE	---	OMMS	GSFC FLOAT
	VVR4	[illegible] 4 VALUE	---	OMMS	GSFC FLOAT
	VVR5	[illegible] 5 VALUE	---	OMMS	GSFC FLOAT
	PDSP	SOLAR WIND PROTON FLOW SPEED	KM/SEC	OPA	ARC FLOAT
	PFLX	SOLAR WIND PROTON FLUX	# CM-2/SEC	OPA	ARC FLOAT
	RLAT	BODY-FIXED LATITUDE OF RADAR FOOTPRINT	DEG.	ORAD	MIT FLOAT
	RLON	BODY-FIXED LONGITUDE OF RADAR FOOTPRINT	DEG.	ORAD	MIT FLOAT
	RRAD	PLANETARY RADIUS RELATIVE TO 6051.2 KM	KM	ORAD	MIT FLOAT
	RRHO	RADAR REFLECTIVITY AT 17 CM WAVELENGTH	----	ORAD	MIT FLOAT
1	SLOP	RMS SURFACE SLOPE AT 1 METER SCALE	DEG.	ORAD	MIT FLOAT
	ETEM	ELECTRON TEMPERATURE	K	ORPA	LMSC FLOAT
	MONE	MASS OF ION 1	AMU	ORPA	LMSC FLOAT
	MTWO	MASS OF ION 2	AMU	ORPA	LMSC FLOAT
	NONE	NUMBER DENSITY FOR ION 1	CM-3	ORPA	LMSC FLOAT
	NTOT	TOTAL ION DENSITY	CM-3	ORPA	LMSC FLOAT
	NTWO	NUMBER DENSITY FOR ION 2	CM-3	ORPA	LMSC FLOAT
	SPOT	SPACECRAFT POTENTIAL	VOLTS	ORPA	LMSC FLOAT
	TONE	ION TEMPERATURE OF ION 1	K	ORPA	LMSC FLOAT
	TTWO	ION TEMPERATURE OF ION 2	K	ORPA	LMSC FLOAT
	XVEL	X COMPONENT OF ION DRIFT VELOCITY	M/SEC	ORPA	LMSC FLOAT
	YVEL	Y COMPONENT OF ION DRIFT VELOCITY	M/SEC	ORPA	LMSC FLOAT
	ZVEL	Z COMPONENT OF ION DRIFT VELOCITY	M/SEC	ORPA	LMSC FLOAT
	AMV	ALTITUDE OF MAX VOLUME EMISSION RATE	KM	OUVS	COLO FLOAT
	CCL	VOLUMETRIC COLUMN EMISSION RATE	CM-2/SEC	OUVS	COLO FLOAT
	MVE	MAXIMUM VOLUME EMISSION RATE	CM-3/SEC	OUVS	COLO FLOAT
	SHT	SCALE HEIGHT	KM	OUVS	COLO FLOAT
	VES	VOLUME EMISSION RATE AT 7/C	CM-3/SEC	OUVS	COLO FLOAT

007 - 2.3

ATTX	S/C ATTITUDE X COMPONENT	[illegible]	SGVS	GOLD FLOAT
ATTY	S/C ATTITUDE Y COMPONENT	---	SEDR	PPO FLOAT
ATTZ	S/C ATTITUDE Z COMPONENT	-	SEDR	PPO FLOAT
DXP1	VELOCITY VECTOR X COMPONENT	---	SEDR	PPO FLOAT
DYP1	VELOCITY VECTOR Y COMPONENT	KM/SEC	SEDR	PPO FLOAT
DZP1	VELOCITY VECTOR Z COMPONENT	KM/SEC	SEDR	PPO FLOAT
LATP	VENUSIAN LATITUDE	KM/SEC	SEDR	PPO FLOAT
LONP	VENUSIAN LONGITUDE	DECIMES	SEDR	PPO FLOAT
MAGR	RADIUS FROM CENTER OF VENUS TO S/C	DEGREES	SEDR	PPO FLOAT
SHA	SOLAR HOUR ANGLE	KM	SEDR	PPO FLOAT
SPIN	SPIN PERIOD	DEGREES	SEDR	PPO FLOAT
SZA	SOLAR ZENITH ANGLE	SEC (DEC)	SEDR	PPO FLOAT
UTMS	UNIVERSAL TIME (TIME)	DEGREES	SEDR	PPO FLOAT
UTYD	UNIVERSAL TIME (YEAR,DAY)	MS (BIN)	SEDR	PPO FIXED
XP1	POSITIONAL VECTOR X COMPONENT	MS (BIN)	SEDR	PPO FIXED
XS1	SUN POSITION X COMPONENT	KM	SEDR	PPO FLOAT
YP1	POSITIONAL VECTOR Y COMPONENT	KM	SEDR	PPO FLOAT
YS1	SUN POSITION Y COMPONENT	KM	SEDR	PPO FLOAT
ZP1	POSITIONAL VECTOR Z COMPONENT	KM	SEDR	PPO FLOAT
ZS1	SUN POSITION Z COMPONENT	KM	SEDR	PPO FLOAT

E; T=0.42/1.15 [illegible]

C>
C>
C>
C>
C>

007 - 2.4

FORMAT OF PIONEER 12 LOW FREQUENCY DATA (LFD) TAPE 008

The Pioneer Venus Low Frequency Data Tape 008 contains the Pioneer Venus orbiting spacecraft's processed Low Frequency Data for Orbits 163 through 254. Note that DSS tracking was unavailable for the Pioneer Venus Orbiter during Orbits 255 through 281, inclusive. Therefore, no data for those orbits will ever be submitted to the NSSDC. The data has been recorded on a 9-track tape at a 800 bpi density. Since this tape was created on an IBM machine, the EBCDIC character set and IBM floating point number format were used where applicable. There are three files on this tape. Each file is followed by a single end-of-file mark. These files in the order of their occurrence are:

FILE 1 - TAPE DESCRIPTION FILE

This file consists of 120 80-character records. Its purpose is to provide a readily available description of the data contained in the tape's second and third files. The file is blocked one logical record per physical record and is wholly comprised of printable EBCDIC characters. See Attachment 1 for a printed copy of this file's contents.

FILE 2 - STATUS FILE

This file consists of 92 266-character records. There is one record for each of the 92 orbits included on this tape. All data is in EBCDIC, printable characters. The data included in each record is as follows:

Bytes	Data	Format	
1-4	Number of orbit described by this record	dddd	4 char
5-10	Date of orbit	yy:DOY	6 char
11-22	UT start time of data included for orbit	HH:MM:SS.MIL	12 char
23-34	UT stop time of data included for orbit	HH:MM:SS.MIL	12 char
35-46	UT of orbit's periapsis	HH:MM:SS.MIL	12 char
47-50	Name of instrument 1	aaaa	4 char
51-52	Number of variables for instrument 1	dd	2 char
53-60	Last date data entered for instrument 1-orbit	MM/DD/YY	8 char
61-64	Total amount of data for instrument 1 for orbit	dddd	4 char
65-68	Total number of instances of "no data avail" for instrument 1 for orbit	dddd	4 char
69-72	Name of instrument 2	aaaa	4 char
73-74	Number of variables for instrument 2	dd	2 char

75-82	Last date data entered for instrument 2-orbit	MM/DD/YY	8 char
83-86	Total amount of data for instrument 2 for orbit	dddd	4 char
87-90	Total number of instances of "no data avail" for instrument 2 for orbit	dddd	4 char
91-94	Name of instrument 3	aaaa	4 char
95-96	Number of variables for instrument 3	dd	2 char
97-104	Last date data entered for instrument 3-orbit	MM/DD/YY	8 char
105-108	Total amount of data for instrument 3 for orbit	dddd	4 char
109-112	Total number of instances of "no data avail" for instrument 3 for orbit	dddd	4 char
113-116	Name of instrument 4	aaaa	4 char
117-118	Number of variables for instrument 4	dd	2 char
119-126	Last date data entered for instrument 4-orbit	MM/DD/YY	8 char
127-130	Total amount of data for instrument 4 for orbit	dddd	4 char
131-134	Total number of instances of "no data avail" for instrument 4 for orbit	dddd	4 char
135-138	Name of instrument 5	aaaa	4 char
139-140	Number of variables for instrument 5	dd	2 char
141-148	Last date data entered for instrument 5-orbit	MM/DD/YY	8 char
149-152	Total amount of data for instrument 5 for orbit	dddd	4 char
153-156	Total number of instances of "no data avail" for instrument 5 for orbit	dddd	4 char
157-160	Name of instrument 6	aaaa	4 char
161-162	Number of variables for instrument 6	dd	2 char
163-170	Last date data entered for instrument 6-orbit	MM/DD/YY	8 char
171-174	Total amount of data for instrument 6 for orbit	dddd	4 char
175-178	Total number of instances of "no data avail" for instrument 6 for orbit	dddd	4 char
179-182	Name of instrument 7	aaaa	4 char

183-184	Number of variables for instrument 7	dd	2 char
185-192	Last date data entered for instrument 7-orbit	MM/DD/YY	8 char
193-196	Total amount of data for instrument 7 for orbit	dddd	4 char
197-200	Total number of instances of "no data avail" for instrument 7 for orbit	dddd	4 char
201-204	Name of instrument 8	aaaa	4 char
205-206	Number of variables for instrument 8	dd	2 char
207-214	Last date data entered for instrument 8-orbit	MM/DD/YY	8 char
215-218	Total amount of data for instrument 8 for orbit	dddd	4 char
219-222	Total number of instances of "no data avail" for instrument 8 for orbit	dddd	4 char
223-226	Name of instrument 9	aaaa	4 char
227-228	Number of variables for instrument 9	dd	2 char
229-236	Last date data entered for instrument 9-orbit	MM/DD/YY	8 char
237-240	Total amount of data for instrument 9 for orbit	dddd	4 char
241-244	Total number of instances of "no data avail" for instrument 9 for orbit	dddd	4 char
245-248	Name of instrument 10	aaaa	4 char
249-250	Number of variables for instrument 10	dd	2 char
251-258	Last date data entered for instrument 10-orbit	MM/DD/YY	8 char
259-262	Total amount of data for instrument 10	dddd	4 char
263-266	Total number of instances of "no data avail" for instrument 10 for orbit	dddd	4 char

FILE 3 - DATA FILE

This file consists of 27,692 376-byte logical records. The logical records are packed ten to a physical record. There are 301 logical records for each of the 92 orbits. These records contain the processed orbital data centered around periapsis sampled at approximately 12-second intervals.

Logical records 1 through 301, inclusive, contain the data for orbit 163. Logical records 302 through 602, inclusive, contain the data for orbit 164, etc.

The first logical record for each orbit contains the data for all of the instruments' variables sampled at the UT start time specified for the orbit in

its status record (File 2). The orbit's second logical record contains the instruments' variables' data sampled 12 seconds after the UT start time. The orbit's third logical record contains the instruments' variables' data sampled 24 seconds after the UT time, etc. The one hundred and fifty-first logical record for an orbit contains the variables' data sampled at the time of periapsis, as specified in the orbit's status record. Due to the characteristics of the available unprocessed data, there may not exist a 12 second interval between the sampling times of the periapsis data in logical record 151 and the data in logical records 150 and 152 for an orbit. However, there will be 12 second intervals between the sampling times of the data in an orbit's records 152 through 301. Therefore, the sampling time of each of an orbit's records may be calculated from the UT start, UT periapsis, and UT stop times in the orbit's status record. It is also available in each record's UTMS and UTYD variables.

Two special values were reserved to indicate the two possible null data conditons. When the LFD data base was initialized, all of the variables' values were set to hexadecimal X'FFFFFFFF' indicating an un-updated null data condition. The second special null data value is a hexadecimal X'7FFFFFFF'. It is used to indicate that data will never be available for a variable for the orbit and sampling time, e.g., when an instrument was turned off during an orbit. All other values found in the data file can be interpreted as actual data.

The order of the instruments' variables' data and their formats in the records of the third file are listed below. Note that the first four bytes of a data record act as a key, giving the record's orbit and nominal time relative to periapsis. A brief description of each of the listed variables can be found in Attachment 2.

BYTES 001-004 KEY FIELD CONSISTING OF:
BYTES 001-002 BINARY ORBIT NUMBER
BYTES 003-004 BINARY 12 SECOND TIME INTERVAL -1800,-1788,...1788,1800
BYTES 005-008 AMV BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 009-012 ATTX BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 013-016 ATTY BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 017-020 ATTZ BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 021-024 BMAG BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 025-028 BXSC BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 029-032 BYSC BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 033-036 BZSC BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 037-040 COL BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 041-044 DBTL BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 045-048 DBTR BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 049-052 DCO BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 053-056 DCO2 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 057-060 DHE BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 061-064 DN2 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 065-068 DO BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 069-072 DXP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 073-076 DYP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 077-080 DZP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 081-084 ELNE BELONGING TO THE OETP INSTR IN FLOATING PT FORMAT
BYTES 085-088 ELTE BELONGING TO THE OETP INSTR IN FLOATING PT FORMAT
BYTES 089-092 EMAG BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT
BYTES 093-096 ETEM BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 097-100 I001 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 101-104 I002 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 105-108 I004 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 109-112 I008 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 113-116 I012 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 117-120 I014 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 121-124 I016 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 125-128 I017 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 129-132 I018 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 133-136 I024 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 137-140 I028 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 141-144 I030 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 145-148 I032 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 149-152 I040 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 153-156 I044 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 157-160 I056 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 161-164 LATP BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 165-168 LONP BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 169-172 MAGR BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 173-176 MI BELONGING TO THE OETP INSTR IN FLOATING PT FORMAT
BYTES 177-180 MONE BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 181-184 MTWO BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 185-188 MVE BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 189-192 NONE BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 193-196 NTOT BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 197-200 NTWO BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 201-204 NVR1 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 205-208 NVR2 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT

BYTES 209-212 NVR3 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 213-216 NVR4 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 217-220 NVR5 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 221-224 PBSP BELONGING TO THE OPA INSTR IN FLOATING PT FORMAT
BYTES 225-228 PFLX BELONGING TO THE OPA INSTR IN FLOATING PT FORMAT
BYTES 229-232 RLAT BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 233-236 RLON BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 237-240 RRAD BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 241-244 RRHO BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 245-248 SHA BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 249-252 SHT BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 253-256 SLOP BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 257-260 SPIN BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 261-264 SPOT BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 265-268 SPR1 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 269-272 SPR2 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 273-276 SZA BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 277-280 TONE BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 281-284 TTWO BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 285-288 UTMS BELONGING TO THE SEDR INSTR IN FIXED DECIMLFORMAT
BYTES 289-292 UTYD BELONGING TO THE SEDR INSTR IN FIXED DECIMLFORMAT
BYTES 293-296 VES BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 297-300 VS BELONGING TO THE OETP INSTR IN FLOATING PT FORMAT
BYTES 301-304 VVR1 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 305-308 VVR2 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 309-312 VVR3 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 313-316 VVR4 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 317-320 VVR5 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 321-324 WVL BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 325-328 XP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 329-332 XS1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 333-336 XVEL BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 337-340 YP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 341-344 YS1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 345-348 YVEL BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 349-352 ZP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 353-356 ZS1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 357-360 ZVEL BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 361-364 100H BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT
BYTES 365-368 31KH BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT
BYTES 369-372 54KH BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT
BYTES 373-376 730H BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT

Attachment C

RIABLE NAMES DICTIONARY FOR ORBITS 275 THROUGH 9999

VARIABLE	DESCRIPTION	UNITS	INST LOC	DATA TYPE
ATTX	S/C ATTITUDE X COMPONENT	---	SEDR PPO	FLOAT
ATTY	S/C ATTITUDE Y COMPONENT	---	SEDR PPO	FLOAT
ATTZ	S/C ATTITUDE Z COMPONENT	---	SEDR PPO	FLOAT
BMAG	MAGNITUDE OF MAGNETIC FIELD	GAMMAS	OMAG UCLA	FLOAT
BXSC	X COMPONENT OF MAGNETIC FIELD	GAMMAS	OMAG UCLA	FLOAT
BYSC	Y COMPONENT OF MAGNETIC FIELD	GAMMAS	OMAG UCLA	FLOAT
BZSC	Z COMPONENT OF MAGNETIC FIELD	GAMMAS	OMAG UCLA	FLOAT
DBTL	DELTA /B/	GAMMAS	OMAG UCLA	FLOAT
DBTR	DELTA /BT/	GAMMAS	OMAG UCLA	FLOAT
DCO	CO NUMBER DENSITY	PART/CC	ONMS GSFC	FLOAT
DCO2	CO2 NUMBER DENSITY	PART/CC	ONMS GSFC	FLOAT
DHE	HE NUMBER DENSITY	PART/CC	ONMS GSFC	FLOAT
DN2	N2 NUMBER DENSITY	PART/CC	ONMS GSFC	FLOAT
DO	O NUMBER DENSITY	PART/CC	ONMS GSFC	FLOAT
DXP1	VELOCITY VECTOR X COMPONENT	KM/SEC	SEDR PPO	FLOAT
DYP1	VELOCITY VECTOR Y COMPONENT	KM/SEC	SEDR PPO	FLOAT
DZP1	VELOCITY VECTOR Z COMPONENT	KM/SEC	SEDR PPO	FLOAT
ELNE	PLASMA DENSITY	N/CC	OETP GSFC	FLOAT
ELTE	ELECTRON TEMPERATURE	DEG K	OETP GSFC	FLOAT
EMAG	MAGNITUDE OF ELECTRIC FIELD	GAUSS	OEFD UCLA	FLOAT
ETEM	ELECTRON TEMPERATURE	K	ORPA LMSC	FLOAT
IC01	NUMBER DENSITY OF H+	CM-3	OIMS GSFC	FLOAT
IC02	NUMBER DENSITY OF H2+,D+	CM-3	OIMS GSFC	FLOAT
IC04	NUMBER DENSITY OF HE+	CM-3	OIMS GSFC	FLOAT
IC08	NUMBER DENSITY OF O++	CM-3	OIMS GSFC	FLOAT
IC12	NUMBER DENSITY OF C+	CM-3	OIMS GSFC	FLOAT
IC14	NUMBER DENSITY OF N+	CM-3	OIMS GSFC	FLOAT
IC16	NUMBER DENSITY OF O+	CM-3	OIMS GSFC	FLOAT
IC17	NUMBER DENSITY OF OH+	CM-3	OIMS GSFC	FLOAT
IC18	NUMBER DENSITY OF H2O+	CM-3	OIMS GSFC	FLOAT
IC24	NUMBER DENSITY OF MG+	CM-3	OIMS GSFC	FLOAT
IC28	NUMBER DENSITY OF N2+,CO+	CM-3	OIMS GSFC	FLOAT
IC30	NUMBER DENSITY OF NO+	CM-3	OIMS GSFC	FLOAT
IC32	NUMBER DENSITY OF O2+	CM-3	OIMS GSFC	FLOAT
IC40	NUMBER DENSITY OF AR+	CM-3	OIMS GSFC	FLOAT
IC44	NUMBER DENSITY OF CO2+	CM-3	OIMS GSFC	FLOAT
IC56	NUMBER DENSITY OF FE+	CM-3	OIMS GSFC	FLOAT
LATP	VENUSIAN LATITUDE	DEGREES	SEDR PPO	FLOAT
LONP	VENUSIAN LONGITUDE	DEGREES	SEDR PPO	FLOAT
MAGR	RADIUS FROM CENTER OF VENUS TO S/C	KM	SEDR PPO	FLOAT
MI	MEAN ION MASS	AMU	OETP GSFC	FLOAT
MONE	MASS OF ION 1	AMU	ORPA LMSC	FLOAT
MTWO	MASS OF ION 2	AMU	ORPA LMSC	FLOAT
NONE	NUMBER DENSITY FOR ION 1	CM-3	ORPA LMSC	FLOAT
NTOT	TOTAL ION DENSITY	CM-3	ORPA LMSC	FLOAT
NTWO	NUMBER DENSITY FOR ION 2	CM-3	ORPA LMSC	FLOAT
NVR1	VARIABLE 1	---	ONMS GSFC	FLOAT
NVR2	VARIABLE 2	---	ONMS GSFC	FLOAT
NVR3	VARIABLE 3	---	ONMS GSFC	FLOAT
NVR4	VARIABLE 4	---	ONMS GSFC	FLOAT
NVR5	VARIABLE 5	---	ONMS GSFC	FLOAT
[illegible]	[illegible] PROTON BULK SPEED	KM/SEC	ORPA ARC	FLOAT

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
?LAT	BODY-FIXED LATITUDE OF RADAR FOOTPRINT	DEG.	ORAD MIT	FLOAT
?LON	BODY-FIXED LINGITUDE OF RADAR FOOTPRINT	DEG.	ORAD MIT	FLOAT
?RAD	PLANETARY RADIUS RELATIVE TO 6051.2 KM	KM	ORAD MIT	FLOAT
?RHO	RADAR REFLECTIVITY AT 17 CM WAVELENGTH	---	ORAD MIT	FLOAT
?HA	SOLAR HOUR ANGLE	DEGREES	SEDR PPO	FLOAT
?LOP	RMS SURFACE SLOPE AT 1 METER SCALE	DEG.	ORAD MIT	FLOAT
?P[illegible]	SPIN PERIOD	SEC (DEC)	SEDR PPO	FLOAT
?P[illegible]	SPACECRAFT POTENTIAL	VOLTS	ORPA LMSC	FLOAT
?PR1	TBD	---	OIMS GSFC	FLOAT
?PR2	TBD	---	OIMS GSFC	FLOAT
?ZA	SOLAR ZENITH ANGLE	DEGREES	SEDR PPO	FLOAT
?ONE	TEMPERATURE OF ION 1	K	ORPA LMSC	FLOAT
?TWO	TEMPERATURE OF ION 2	K	ORPA LMSC	FLOAT
?TMS	UNIVERSAL TIME (TIME)	MS (BIN)	SEDR PPO	FIXED
?TYD	UNIVERSAL TIME (YEAR,DAY)	MS (BIN)	SEDR PPO	FIXED
?VC	OUVS DATA WORD	---	OUVS COLO	FLOAT
?V1	OUVS DATA WORD 1	---	OUVS COLO	FLOAT
?V2	OUVS DATA WORD 2	---	OUVS COLO	FLOAT
?V3	OUVS DATA WORD 3	---	OUVS COLO	FLOAT
?V4	OUVS DATA WORD 4	---	OUVS COLO	FLOAT
?V5	OUVS DATA WORD 5	---	OUVS COLO	FLOAT
?S	SPACECRAFT POTENTIAL	VOLTS	OETP GSFC	FLOAT
?VR1	VARIABLE 1 VALUE	---	ONMS GSFC	FLOAT
?VR2	VARIABLE 2 VALUE	---	ONMS GSFC	FLOAT
?VR3	VARIABLE 3 VALUE	---	ONMS GSFC	FLOAT
?VR4	VARIABLE 4 VALUE	---	ONMS GSFC	FLOAT
?VR5	VARIABLE 5 VALUE	---	ONMS GSFC	FLOAT
?P1	POSITIONAL VECTOR X COMPONENT	KM	SEDR PPO	FLOAT
?S1	SUN POSITION X COMPONENT	KM	SEDR PPO	FLOAT
XVEL	X COMPONENT OF ION DRIFT VELOCITY	M/SEC	ORPA LMSC	FLOAT
?P1	POSITIONAL VECTOR Y COMPONENT	KM	SEDR PPO	FLOAT
?S1	SUN POSITION Y COMPONENT	KM	SEDR PPO	FLOAT
?V[illegible]	Y COMPONENT OF ION DRIFT VELOCITY	M/SEC	ORPA LMSC	FLOAT
ZP1	POSITIONAL VECTOR Z COMPONENT	KM	SEDR PPO	FLOAT
ZS1	SUN POSITION Z COMPONENT	KM	SEDR PPO	FLOAT
ZVEL	Z COMPONENT OF ION DRIFT VELOCITY	M/SEC	ORPA LMSC	FLOAT
?00H	FREQUENCY CHANNEL CENTERED AT 100HZ	---	OEFD UCLA	FLOAT
31KH	FREQUENCY CHANNEL CENTERED AT 31KHZ	---	OEFD UCLA	FLOAT
54KH	FREQUENCY CHANNEL CENTERED AT 5-4KHZ	---	OEFD UCLA	FLOAT
?30H	FREQUENCY CHANNEL CENTERED AT 730HZ	---	OEFD UCLA	FLOAT

VARIABLE NAMES DICTIONARY FOR ORBITS 275 THROUGH 9999

VARIABLE	DESCRIPTION	UNITS	INST LOC	DATA TYPE
EMAG	MAGNITUDE OF ELECTRIC FIELD	GAUSS	OEFD UCLA	FLOAT
100H	FREQUENCY CHANNEL CENTERED AT 100HZ	---	OEFD UCLA	FLOAT
31KH	FREQUENCY CHANNEL CENTERED AT 31KHZ	---	OEFD UCLA	FLOAT
54KH	FREQUENCY CHANNEL CENTERED AT 5-4KHZ	---	OEFD UCLA	FLOAT
730H	FREQUENCY CHANNEL CENTERED AT 730HZ	---	OEFD UCLA	FLOAT
ELNE	PLASMA DENSITY	N/CC	OETP GSFC	FLOAT
ELTE	ELECTRON TEMPERATURE	DEG K	OETP GSFC	FLOAT
MI	MEAN ION MASS	AMU	OETP GSFC	FLOAT
VS	SPACECRAFT POTENTIAL	VOLTS	OETP GSFC	FLOAT
IOO1	NUMBER DENSITY OF H+	CM-3	OIMS GSFC	FLOAT
IOO2	NUMBER DENSITY OF H2+,D+	CM-3	OIMS GSFC	FLOAT
IOO4	NUMBER DENSITY OF HE+	CM-3	OIMS GSFC	FLOAT
IOO8	NUMBER DENSITY OF O++	CM-3	OIMS GSFC	FLOAT
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

IO14	NUMBER DENSITY OF N+	CM-3	OIMS	GSFC	FLOAT
IO16	NUMBER DENSITY OF O+	CM-3	OIMS	GSFC	FLOAT
IO17	NUMBER DENSITY OF OH+	CM-3	OIMS	GSFC	FLOAT
IO18	NUMBER DENSITY OF H2O+	CM-3	OIMS	GSFC	FLOAT
IO24	NUMBER DENSITY OF MG+	CM-3	OIMS	GSFC	FLOAT
IO28	NUMBER DENSITY OF N2+,CO+	CM-3	OIMS	GSFC	FLOAT
IO30	NUMBER DENSITY OF NO+	CM-3	OIMS	GSFC	FLOAT
IO32	NUMBER DENSITY OF O2+	CM-3	OIMS	GSFC	FLOAT
IO40	NUMBER DENSITY OF AR+	CM-3	OIMS	GSFC	FLOAT
IO44	NUMBER DENSITY OF CO2+	CM-3	OIMS	GSFC	FLOAT
IO56	NUMBER DENSITY OF FE+	CM-3	OIMS	GSFC	FLOAT
SPR1	TBD	---	OIMS	GSFC	FLOAT
SPR2	TBD	---	OIMS	GSFC	FLOAT
BMAG	MAGNITUDE OF MAGNETIC FIELD	GAMMAS	OMAG	UCLA	FLOAT
BXSC	X COMPONENT OF MAGNETIC FIELD	GAMMAS	OMAG	UCLA	FLOAT
BYSC	Y COMPONENT OF MAGNETIC FIELD	GAMMAS	OMAG	UCLA	FLOAT
BZSC	Z COMPONENT OF MAGNETIC FIELD	GAMMAS	OMAG	UCLA	FLOAT
DBTL	DELTA /B/	GAMMAS	OMAG	UCLA	FLOAT
DBTR	DELTA /BT/	GAMMAS	OMAG	UCLA	FLOAT
DCO	CO NUMBER DENSITY	PART/CC	ONMS	GSFC	FLOAT
DCO2	CO2 NUMBER DENSITY	PART/CC	ONMS	GSFC	FLOAT
DHE	HE NUMBER DENSITY	PART/CC	ONMS	GSFC	FLOAT
DN2	N2 NUMBER DENSITY	PART/CC	ONMS	GSFC	FLOAT
DO	O NUMBER DENSITY	PART/CC	ONMS	GSFC	FLOAT
NVR1	VARIABLE 1	---	ONMS	GSFC	FLOAT
NVR2	VARIABLE 2	---	ONMS	GSFC	FLOAT
NVR3	VARIABLE 3	---	ONMS	GSFC	FLOAT
NVR4	VARIABLE 4	---	ONMS	GSFC	FLOAT
NVR5	VARIABLE 5	---	ONMS	GSFC	FLOAT
VVR1	VARIABLE 1 VALUE	---	ONMS	GSFC	FLOAT
VVR2	VARIABLE 2 VALUE	---	ONMS	GSFC	FLOAT
VVR3	VARIABLE 3 VALUE	---	ONMS	GSFC	FLOAT
VVR4	VARIABLE 4 VALUE	---	ONMS	GSFC	FLOAT
VVR5	VARIABLE 5 VALUE	---	ONMS	GSFC	FLOAT
PBSP	SOLAR WIND PROTON BULK SPEED	KM/SEC	OPA	ARC	FLOAT
PFLX	SOLAR WIND PROTON FLUX	# CM-2/SEC	OPA	ARC	FLOAT
RLAT	BODY-FIXED LATITUDE OF RADAR FOOTPRINT	DEG.	ORAD	MIT	FLOAT
RLON	BODY-FIXED LINGITUDE OF RADAR FOOTPRINT	DEG.	ORAD	MIT	FLOAT
RRAD	PLANETARY RADIUS RELATIVE TO 6051.2 KM	KM	ORAD	MIT	FLOAT
RRHO	RADAR REFLECTIVITY AT 17 CM WAVELENGTH	----	ORAD	MIT	FLOAT
SLOP	RMS SURFACE SLOPE AT 1 METER SCALE	DEG.	ORAD	MIT	FLOAT
ETEM	ELECTRON TEMPERATURE	K	ORPA	LMSC	FLOAT
MONE	MASS OF ION 1	AMU	ORPA	LMSC	FLOAT
MTWO	MASS OF ION 2	AMU	ORPA	LMSC	FLOAT
NONE	NUMBER DENSITY FOR ION 1	CM-3	ORPA	LMSC	FLOAT
NTOT	TOTAL ION DENSITY	CM-3	ORPA	LMSC	FLOAT
NTWO	NUMBER DENSITY FOR ION 2	CM-3	ORPA	LMSC	FLOAT
SPOT	SPACECRAFT POTENTIAL	VOLTS	ORPA	LMSC	FLOAT
TONE	TEMPERATURE OF ION 1	K	ORPA	LMSC	FLOAT
TTWO	TEMPERATURE OF ION 2	K	ORPA	LMSC	FLOAT
XVEL	X COMPONENT OF ION DRIFT VELOCITY	M/SEC	ORPA	LMSC	FLOAT
YVEL	Y COMPONENT OF ION DRIFT VELOCITY	M/SEC	ORPA	LMSC	FLOAT
ZVEL	Z COMPONENT OF ION DRIFT VELOCITY	M/SEC	ORPA	LMSC	FLOAT
UVC	OUVS DATA WORD	---	OUVS	COLO	FLOAT
UV1	OUVS DATA WORD 1	---	OUVS	COLO	FLOAT
UV2	OUVS DATA WORD 2	---	OUVS	COLO	FLOAT
UV3	OUVS DATA WORD 3	---	OUVS	COLO	FLOAT
UV4	OUVS DATA WORD 4	---	OUVS	COLO	FLOAT

OV5	OUVS DATA WORD 5	---	OUVS	COLO	FLOAT
ATTX	S/C ATTITUDE X COMPONENT	---	SEDR	PPO	FLOAT
ATTY	S/C ATTITUDE Y COMPONENT	---	SEDR	PPO	FLOAT
ATTZ	S/C ATTITUDE Z COMPONENT	---	SEDR	PPO	FLOAT
DXP1	VELOCITY VECTOR X COMPONENT	KM/SEC	SEDR	PPO	FLOAT
DYP1	VELOCITY VECTOR Y COMPONENT	KM/SEC	SEDR	PPO	FLOAT
DZP1	VELOCITY VECTOR Z COMPONENT	KM/SEC	SEDR	PPO	FLOAT
LATP	VENUSIAN LATITUDE	DEGREES	SEDR	PPO	FLOAT
LONP	VENUSIAN LONGITUDE	DEGREES	SEDR	PPO	FLOAT
MAGR	RADIUS FROM CENTER OF VENUS TO S/C	KM	SEDR	PPO	FLOAT
SHA	SOLAR HOUR ANGLE	DEGREES	SEDR	PPO	FLOAT
SPIN	SPIN PERIOD	SEC (DEC)	SEDR	PPO	FLOAT
SZA	SOLAR ZENITH ANGLE	DEGREES	SEDR	PPO	FLOAT
UTMS	UNIVERSAL TIME (TIME)	MS (BIN)	SEDR	PPO	FIXED
UTYD	UNIVERSAL TIME (YEAR,DAY)	MS (BIN)	SEDR	PPO	FIXED
XP1	POSITIONAL VECTOR X COMPONENT	KM	SEDR	PPO	FLOAT
XS1	SUN POSITION X COMPONENT	KM	SEDR	PPO	FLOAT
YP1	POSITIONAL VECTOR Y COMPONENT	KM	SEDR	PPO	FLOAT
YS1	SUN POSITION Y COMPONENT	KM	SEDR	PPO	FLOAT
ZP1	POSITIONAL VECTOR Z COMPONENT	KM	SEDR	PPO	FLOAT
ZS1	SUN POSITION Z COMPONENT	KM	SEDR	PPO	FLOAT

LEASE LOG IN

FORMAT OF PIONEER 12 LOW FREQUENCY DATA (LFD) TAPE 009

The Pioneer Venus Low Frequency Data Tape 009 contains the Pioneer Venus orbiting spacecraft's processed Low Frequency Data for Orbits 282 through 406. The data has been recorded on a 9-track tape at a 800 bpi density. Since this tape was created on an IBM machine, the EBCDIC character set and IBM floating point number format were used where applicable. There are three files on this tape. Each file is followed by a single end-of-file mark. These files in the order of their occurrence are:

FILE 1 - TAPE DESCRIPTION FILE

This file consists of 120 80-character records. Its purpose is to provide a readily available description of the data contained in the tape's second and third files. The file is blocked one logical record per physical record and is wholly comprised of printable EBCDIC characters. See Attachment 1 for a printed copy of this file's contents.

FILE 2 - STATUS FILE

This file consists of 125 266-character records. There is one record for each of the 125 orbits included on this tape. All data is in EBCDIC, printable characters. The data included in each record is as follows:

Bytes	Data	Format	
1-4	Number of orbit described by this record	dddd	4 char
5-10	Date of orbit	yy:DOY	6 char
11-22	UT start time of data included for orbit	HH:MM:SS.MIL	12 char
23-34	UT stop time of data included for orbit	HH:MM:SS.MIL	12 char
35-46	UT of orbit's periapsis	HH:MM:SS.MIL	12 char
47-50	Name of instrument 1	aaaa	4 char
51-52	Number of variables for instrument 1	dd	2 char
53-60	Last date data entered for instrument 1-orbit	MM/DD/YY	8 char
61-64	Total amount of data for instrument 1 for orbit	dddd	4 char
65-68	Total number of instances of "no data avail" for instrument 1 for orbit	dddd	4 char
69-72	Name of instrument 2	aaaa	4 char
73-74	Number of variables for instrument 2	dd	2 char
75-82	Last date data entered for instrument 2-orbit	MM/DD/YY	8 char

83-86	Total amount of data for instrument 2 for orbit	dddd	4 char
87-90	Total number of instances of "no data avail" for instrument 2 for orbit	dddd	4 char
91-94	Name of instrument 3	aaaa	4 char
95-96	Number of variables for instrument 3	dd	2 char
97-104	Last date data entered for instrument 3-orbit	MM/DD/YY	8 char
105-108	Total amount of data for instrument 3 for orbit	dddd	4 char
109-112	Total number of instances of "no data avail" for instrument 3 for orbit	dddd	4 char
113-116	Name of instrument 4	aaaa	4 char
117-118	Number of variables for instrument 4	dd	2 char
119-126	Last date data entered for instrument 4-orbit	MM/DD/YY	8 char
127-130	Total amount of data for instrument 4 for orbit	dddd	4 char
131-134	Total number of instances of "no data avail" for instrument 4 for orbit	dddd	4 char
135-138	Name of instrument 5	aaaa	4 char
139-140	Number of variables for instrument 5	dd	2 char
141-148	Last date data entered for instrument 5-orbit	MM/DD/YY	8 char
149-152	Total amount of data for instrument 5 for orbit	dddd	4 char
153-156	Total number of instances of "no data avail" for instrument 5 for orbit	dddd	4 char
157-160	Name of instrument 6	aaaa	4 char
161-162	Number of variables for instrument 6	dd	2 char
163-170	Last date data entered for instrument 6-orbit	MM/DD/YY	8 char
171-174	Total amount of data for instrument 6 for orbit	dddd	4 char
175-178	Total number of instances of "no data avail" for instrument 6 for orbit	dddd	4 char
179-182	Name of instrument 7	aaaa	4 char
183-184	Number of variables for instrument 7	dd	2 char

185-192	Last date data entered for instrument 7-orbit	MM/DD/YY	8 char
193-196	Total amount of data for instrument 7 for orbit	dddd	4 char
197-200	Total number of instances of "no data avail" for instrument 7 for orbit	dddd	4 char
201-204	Name of instrument 8	aaaa	4 char
205-206	Number of variables for instrument 8	dd	2 char
207-214	Last date data entered for instrument 8-orbit	MM/DD/YY	8 char
215-218	Total amount of data for instrument 8 for orbit	dddd	4 char
219-222	Total number of instances of "no data avail" for instrument 8 for orbit	dddd	4 char
223-226	Name of instrument 9	aaaa	4 char
227-228	Number of variables for instrument 9	dd	2 char
229-236	Last date data entered for instrument 9-orbit	MM/DD/YY	8 char
237-240	Total amount of data for instrument 9 for orbit	dddd	4 char
241-244	Total number of instances of "no data avail" for instrument 9 for orbit	dddd	4 char
245-248	Name of instrument 10	aaaa	4 char
249-250	Number of variables for instrument 10	dd	2 char
251-258	Last date data entered for instrument 10-orbit	MM/DD/YY	8 char
259-262	Total amount of data for instrument 10	dddd	4 char
263-266	Total number of instances of "no data avail" for instrument 10 for orbit	dddd	4 char

FILE 3 - DATA FILE

This file consists of 37,625 376-byte logical records. The logical records are packed ten to a physical record. There are 301 logical records for each of the 125 orbits. These records contain the processed orbital data centered around periapsis sampled at approximately 12-second intervals.

Logical records 1 through 301, inclusive, contain the data for orbit 282. Logical records 302 through 602, inclusive, contain the data for orbit 283, etc.

The first logical record for each orbit contains the data for all of the instruments' variables sampled at the UT start time specified for the orbit in its status record (File 2). The orbit's second logical record contains the instruments' variables' data sampled 12 seconds after the UT start time. The

orbit's third logical record contains the instruments' variables' data sampled 24 seconds after the UT time, etc. The one hundred and fifty-first logical record for an orbit contains the variables' data sampled at the time of periapsis, as specified in the orbit's status record. Due to the characteristics of the available unprocessed data, there may not exist a 12 second interval between the sampling times of the periapsis data in logical record 151 and the data in logical records 150 and 152 for an orbit. However, there will be 12 second intervals between the sampling times of the data in an orbit's records 152 through 301. Therefore, the sampling time of each of an orbit's records may be calculated from the UT start, UT periapsis, and UT stop times in the orbit's status record. It is also available in each record's UTMS and UTYD variables.

Two special values were reserved to indicate the two possible null data conditons. When the LFD data base was initialized, all of the variables' values were set to hexadecimal X'FFFFFFFF' indicating an un-updated null data condition. The second special null data value is a hexadecimal X'7FFFFFFF'. It is used to indicate that data will never be available for a variable for the orbit and sampling time, e.g., when an instrument was turned off during an orbit. All other values found in the data file can be interpreted as actual data.

The order of the instruments' variables' data and their formats in the records of the third file are listed below. Note that the first four bytes of a data record act as a key, giving the record's orbit and nominal time relative to periapsis. A brief description of each of the listed variables can be found in Attachment 2.

BYTES 001-004 KEY FIELD CONSISTING OF:
  BYTES 001-002 BINARY ORBIT NUMBER
  BYTES 003-004 BINARY 12 SECOND TIME INTERVAL -1800,-1788,...1788,1800
  BYTES 005-008 ATTX BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
  BYTES 009-012 ATTY BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
  BYTES 013-016 ATTZ BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
  BYTES 017-020 BMAG BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
  BYTES 021-024 BXSC BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
  BYTES 025-028 BYSC BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
  BYTES 029-032 BZSC BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
  BYTES 033-036 DBTL BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
  BYTES 037-040 DBTR BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
  BYTES 041-044 DCO BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
  BYTES 045-048 DCO2 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
  BYTES 049-052 DHE BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
  BYTES 053-056 DN2 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
  BYTES 057-060 DO   BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
  BYTES 061-064 DXP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
  BYTES 065-068 DYP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
  BYTES 069-072 DZP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
  BYTES 073-076 ELNE BELONGING TO THE OETP INSTR IN FLOATING PT FORMAT
  BYTES 077-080 ELTE BELONGING TO THE OETP INSTR IN FLOATING PT FORMAT
  BYTES 081-084 EMAG BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT
  BYTES 085-088 ETEM BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
  BYTES 089-092 I001 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
  BYTES 093-096 I002 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
  BYTES 097-100 I004 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
  BYTES 101-104 I008 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
  BYTES 105-108 I012 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
  BYTES 109-112 I014 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
  BYTES 113-116 I016 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
  BYTES 117-120 I017 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
  BYTES 121-124 I018 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
  BYTES 125-128 I024 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
  BYTES 129-132 I028 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
  BYTES 133-136 I030 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
  BYTES 137-140 I032 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
  BYTES 141-144 I040 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
  BYTES 145-148 I044 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
  BYTES 149-152 I056 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
  BYTES 153-156 LATP BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
  BYTES 157-160 LONP BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
  BYTES 161-164 MAGR BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
  BYTES 165-168 MI   BELONGING TO THE OETP INSTR IN FLOATING PT FORMAT
  BYTES 169-172 MONE BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
  BYTES 173-176 MTWO BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
  BYTES 177-180 NONE BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
  BYTES 181-184 NTOT BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
  BYTES 185-188 NTWO BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
  BYTES 189-192 NVR1 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
  BYTES 193-196 NVR2 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
  BYTES 197-200 NVR3 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
  BYTES 201-204 NVR4 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
  BYTES 205-208 NVR5 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT

BYTES 209-212 PBSP BELONGING TO THE OPA INSTR IN FLOATING PT FORMAT
BYTES 213-216 PFLX BELONGING TO THE OPA INSTR IN FLOATING PT FORMAT
BYTES 217-220 RLAT BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 221-224 RLON BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 225-228 RRAD BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 229-232 RRHO BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 233-236 SHA BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 237-240 SLOP BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 241-244 SPIN BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 245-248 SPOT BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 249-252 SPR1 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 253-256 SPR2 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 257-260 SZA BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 261-264 TONE BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 265-268 TTWO BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 269-272 UTMS BELONGING TO THE SEDR INSTR IN FIXED DECIMLFORMAT
BYTES 273-276 UTYD BELONGING TO THE SEDR INSTR IN FIXED DECIMLFORMAT
BYTES 277-280 UVC BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 281-284 UV1 BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 285-288 UV2 BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 289-292 UV3 BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 293-296 UV4 BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 297-300 UV5 BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 301-304 VS BELONGING TO THE OETP INSTR IN FLOATING PT FORMAT
BYTES 305-308 VVR1 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 309-312 VVR2 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 313-316 VVR3 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 317-320 VVR4 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 321-324 VVR5 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 325-328 XP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 329-332 XS1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 333-336 XVEL BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 337-340 YP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 341-344 YS1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 345-348 YVEL BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 349-352 ZP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 353-356 ZS1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 357-360 ZVEL BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 361-364 100H BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT
BYTES 365-368 31KH BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT
BYTES 369-372 54KH BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT
BYTES 373-376 730H BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT

FORMAT OF PIONEER 12 LOW FREQUENCY DATA (LFD) TAPE 010

The Pioneer Venus Low Frequency Data Tape 010 contains the Pioneer Venus orbiting spacecraft's processed Low Frequency Data for Orbits 407 through 486. The data has been recorded on a 9-track tape at a 800 bpi density. Since this tape was created on an IBM machine, the EBCDIC character set and IBM floating point number format were used where applicable. There are three files on this tape. Each file is followed by a single end-of-file mark. These files in the order of their occurrence are:

FILE 1 - TAPE DESCRIPTION FILE

This file consists of 120 80-character records. Its purpose is to provide a readily available description of the data contained in the tape's second and third files. The file is blocked one logical record per physical record and is wholly comprised of printable EBCDIC characters. See Attachment 1 for a printed copy of this file's contents.

FILE 2 - STATUS FILE

This file consists of 80 266-character records. There is one record for each of the 80 orbits included on this tape. All data is in EBCDIC, printable characters. The data included in each record is as follows:

Bytes	Data	Format	
1-4	Number of orbit described by this record	dddd	4 char
5-10	Date of orbit	yy:DOY	6 char
11-22	UT start time of data included for orbit	HH:MM:SS.MIL	12 char
23-34	UT stop time of data included for orbit	HH:MM:SS.MIL	12 char
35-46	UT of orbit's periapsis	HH:MM:SS.MIL	12 char
47-50	Name of instrument 1	aaaa	4 char
51-52	Number of variables for instrument 1	dd	2 char
53-60	Last date data entered for instrument 1-orbit	MM/DD/YY	8 char
61-64	Total amount of data for instrument 1 for orbit	dddd	4 char
65-68	Total number of instances of "no data avail" for instrument 1 for orbit	dddd	4 char
69-72	Name of instrument 2	aaaa	4 char
73-74	Number of variables for instrument 2	dd	2 char
75-82	Last date data entered for instrument 2-orbit	MM/DD/YY	8 char

83-86	Total amount of data for instrument 2 for orbit	dddd	4 char
87-90	Total number of instances of "no data avail" for instrument 2 for orbit	dddd	4 char
91-94	Name of instrument 3	aaaa	4 char
95-96	Number of variables for instrument 3	dd	2 char
97-104	Last date data entered for instrument 3-orbit	MM/DD/YY	8 char
105-108	Total amount of data for instrument 3 for orbit	dddd	4 char
109-112	Total number of instances of "no data avail" for instrument 3 for orbit	dddd	4 char
113-116	Name of instrument 4	aaaa	4 char
117-118	Number of variables for instrument 4	dd	2 char
119-126	Last date data entered for instrument 4-orbit	MM/DD/YY	8 char
127-130	Total amount of data for instrument 4 for orbit	dddd	4 char
131-134	Total number of instances of "no data avail" for instrument 4 for orbit	dddd	4 char
135-138	Name of instrument 5	aaaa	4 char
139-140	Number of variables for instrument 5	dd	2 char
141-148	Last date data entered for instrument 5-orbit	MM/DD/YY	8 char
149-152	Total amount of data for instrument 5 for orbit	dddd	4 char
153-156	Total number of instances of "no data avail" for instrument 5 for orbit	dddd	4 char
157-160	Name of instrument 6	aaaa	4 char
161-162	Number of variables for instrument 6	dd	2 char
163-170	Last date data entered for instrument 6-orbit	MM/DD/YY	8 char
171-174	Total amount of data for instrument 6 for orbit	dddd	4 char
175-178	Total number of instances of "no data avail" for instrument 6 for orbit	dddd	4 char
179-182	Name of instrument 7	aaaa	4 char
183-184	Number of variables for instrument 7	dd	2 char

185-192	Last date data entered for instrument 7-orbit	MM/DD/YY	8 char
193-196	Total amount of data for instrument 7 for orbit	dddd	4 char
197-200	Total number of instances of "no data avail" for instrument 7 for orbit	dddd	4 char
201-204	Name of instrument 8	aaaa	4 char
205-206	Number of variables for instrument 8	dd	2 char
207-214	Last date data entered for instrument 8-orbit	MM/DD/YY	8 char
215-218	Total amount of data for instrument 8 for orbit	dddd	4 char
219-222	Total number of instances of "no data avail" for instrument 8 for orbit	dddd	4 char
223-226	Name of instrument 9	aaaa	4 char
227-228	Number of variables for instrument 9	dd	2 char
229-236	Last date data entered for instrument 9-orbit	MM/DD/YY	8 char
237-240	Total amount of data for instrument 9 for orbit	dddd	4 char
241-244	Total number of instances of "no data avail" for instrument 9 for orbit	dddd	4 char
245-248	Name of instrument 10	aaaa	4 char
249-250	Number of variables for instrument 10	dd	2 char
251-258	Last date data entered for instrument 10-orbit	MM/DD/YY	8 char
259-262	Total amount of data for instrument 10	dddd	4 char
263-266	Total number of instances of "no data avail" for instrument 10 for orbit	dddd	4 char

FILE 3 - DATA FILE

This file consists of 24,080 376-byte logical records. The logical records are packed ten to a physical record. There are 301 logical records for each of the 80 orbits. These records contain the processed orbital data centered around periapsis sampled at approximately 12-second intervals.

Logical records 1 through 301, inclusive, contain the data for orbit 407. Logical records 302 through 602, inclusive, contain the data for orbit 408, etc.

The first logical record for each orbit contains the data for all of the instruments' variables sampled at the UT start time specified for the orbit in its status record (File 2). The orbit's second logical record contains the instruments' variables' data sampled 12 seconds after the UT start time. The

orbit's third logical record contains the instruments' variables' data sampled 24 seconds after the UT time, etc. The one hundred and fifty-first logical record for an orbit contains the variables' data sampled at the time of periapsis, as specified in the orbit's status record. Due to the characteristics of the available unprocessed data, there may not exist a 12 second interval between the sampling times of the periapsis data in logical record 151 and the data in logical records 150 and 152 for an orbit. However, there will be 12 second intervals between the sampling times of the data in an orbit's records 152 through 301. Therefore, the sampling time of each of an orbit's records may be calculated from the UT start, UT periapsis, and UT stop times in the orbit's status record. It is also available in each record's UTMS and UTYD variables.

Two special values were reserved to indicate the two possible null data conditons. When the LFD data base was initialized, all of the variables' values were set to hexadecimal X'FFFFFFFF' indicating an un-updated null data condition. The second special null data value is a hexadecimal X'7FFFFFFF'. It is used to indicate that data will never be available for a variable for the orbit and sampling time, e.g., when an instrument was turned off during an orbit. All other values found in the data file can be interpreted as actual data.

The order of the instruments' variables' data and their formats in the records of the third file are listed below. Note that the first four bytes of a data record act as a key, giving the record's orbit and nominal time relative to periapsis. A brief description of each of the listed variables can be found in Attachment 2.

BYTES 001-004 KEY FIELD CONSISTING OF:
BYTES 001-002 BINARY ORBIT NUMBER
BYTES 003-004 BINARY 12 SECOND TIME INTERVAL -1800,-1788,...1788,1800
BYTES 005-008 AMV BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 009-012 ATTX BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 013-016 ATTY BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 017-020 ATTZ BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 021-024 BMAG BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 025-028 BXSC BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 029-032 BYSC BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 033-036 BZSC BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 037-040 COL BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 041-044 DBTL BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 045-048 DBTR BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 049-052 DCO BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 053-056 DCO2 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 057-060 DHE BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 061-064 DN2 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 065-068 DO BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 069-072 DXP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 073-076 DYP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 077-080 DZP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 081-084 ELNE BELONGING TO THE OETP INSTR IN FLOATING PT FORMAT
BYTES 085-088 ELTE BELONGING TO THE OETP INSTR IN FLOATING PT FORMAT
BYTES 089-092 EMAG BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT
BYTES 093-096 ETEM BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 097-100 I001 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 101-104 I002 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 105-108 I004 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 109-112 I008 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 113-116 I012 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 117-120 I014 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 121-124 I016 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 125-128 I017 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 129-132 I018 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 133-136 I024 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 137-140 I028 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 141-144 I030 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 145-148 I032 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 149-152 I040 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 153-156 I044 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 157-160 I056 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 161-164 LATP BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 165-168 LONP BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 169-172 MAGR BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 173-176 MI BELONGING TO THE OETP INSTR IN FLOATING PT FORMAT
BYTES 177-180 MONE BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 181-184 MTWO BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 185-188 MVE BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 189-192 NONE BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 193-196 NTOT BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 197-200 NTWO BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 201-204 NVR1 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 205-208 NVR2 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT

BYTES 209-212 NVR3 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 213-216 NVR4 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 217-220 NVR5 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 221-224 PBSP BELONGING TO THE OPA INSTR IN FLOATING PT FORMAT
BYTES 225-228 PFLX BELONGING TO THE OPA INSTR IN FLOATING PT FORMAT
BYTES 229-232 RLAT BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 233-236 RLON BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 237-240 RRAD BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 241-244 RRHO BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 245-248 SHA BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 249-252 SHT BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 253-256 SLOP BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 257-260 SPIN BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 261-264 SPOT BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 265-268 SPR1 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 269-272 SPR2 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 273-276 SZA BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 277-280 TONE BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 281-284 TTWO BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 285-288 UTMS BELONGING TO THE SEDR INSTR IN FIXED DECIMLFORMAT
BYTES 289-292 UTYD BELONGING TO THE SEDR INSTR IN FIXED DECIMLFORMAT
BYTES 293-296 VES BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 297-300 VS BELONGING TO THE OETP INSTR IN FLOATING PT FORMAT
BYTES 301-304 VVR1 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 305-308 VVR2 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 309-312 VVR3 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 313-316 VVR4 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 317-320 VVR5 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 321-324 WVL BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 325-328 XP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 329-332 XS1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 333-336 XVEL BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 337-340 YP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 341-344 YS1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 345-348 YVEL BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 349-352 ZP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 353-356 ZS1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 357-360 ZVEL BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 361-364 100H BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT
BYTES 365-368 31KH BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT
BYTES 369-372 54KH BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT
BYTES 373-376 730H BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT

FORMAT OF PIONEER 12 LOW FREQUENCY DATA (LFD) TAPE 011

The Pioneer Venus Low Frequency Data Tape 011 contains the Pioneer Venus orbiting spacecraft's processed Low Frequency Data for Orbits 487 through 611. The data has been recorded on a 9-track tape at a 800 bpi density. Since this tape was created on an IBM machine, the EBCDIC character set and IBM floating point number format were used where applicable. There are three files on this tape. Each file is followed by a single end-of-file mark. These files in the order of their occurrence are:

FILE 1 - TAPE DESCRIPTION FILE

This file consists of 120 80-character records. Its purpose is to provide a readily available description of the data contained in the tape's second and third files. The file is blocked one logical record per physical record and is wholly comprised of printable EBCDIC characters. See Attachment 1 for a printed copy of this file's contents.

FILE 2 - STATUS FILE

This file consists of 125 266-character records. There is one record for each of the 125 orbits included on this tape. All data is in EBCDIC, printable characters. The data included in each record is as follows:

Bytes	Data	Format	
1-4	Number of orbit described by this record	dddd	4 char
5-10	Date of orbit	yy:DOY	6 char
11-22	UT start time of data included for orbit	HH:MM:SS.MIL	12 char
23-34	UT stop time of data included for orbit	HH:MM:SS.MIL	12 char
35-46	UT of orbit's periapsis	HH:MM:SS.MIL	12 char
47-50	Name of instrument 1	aaaa	4 char
51-52	Number of variables for instrument 1	dd	2 char
53-60	Last date data entered for instrument 1-orbit	MM/DD/YY	8 char
61-64	Total amount of data for instrument 1 for orbit	dddd	4 char
65-68	Total number of instances of "no data avail" for instrument 1 for orbit	dddd	4 char
69-72	Name of instrument 2	aaaa	4 char
73-74	Number of variables for instrument 2	dd	2 char
75-82	Last date data entered for instrument 2-orbit	MM/DD/YY	8 char

Hy Tape 011 (cont.)

83-86	Total amount of data for instrument 2 for orbit	dddd	4 char
87-90	Total number of instances of "no data avail" for instrument 2 for orbit	dddd	4 char
91-94	Name of instrument 3	aaaa	4 char
95-96	Number of variables for instrument 3	dd	2 char
97-104	Last date data entered for instrument 3-orbit	MM/DD/YY	8 char
105-108	Total amount of data for instrument 3 for orbit	dddd	4 char
109-112	Total number of instances of "no data avail" for instrument 3 for orbit	dddd	4 char
113-116	Name of instrument 4	aaaa	4 char
117-118	Number of variables for instrument 4	dd	2 char
119-126	Last date data entered for instrument 4-orbit	MM/DD/YY	8 char
127-130	Total amount of data for instrument 4 for orbit	dddd	4 char
131-134	Total number of instances of "no data avail" for instrument 4 for orbit	dddd	4 char
135-138	Name of instrument 5	aaaa	4 char
139-140	Number of variables for instrument 5	dd	2 char
141-148	Last date data entered for instrument 5-orbit	MM/DD/YY	8 char
149-152	Total amount of data for instrument 5 for orbit	dddd	4 char
153-156	Total number of instances of "no data avail" for instrument 5 for orbit	dddd	4 char
157-160	Name of instrument 6	aaaa	4 char
161-162	Number of variables for instrument 6	dd	2 char
163-170	Last date data entered for instrument 6-orbit	MM/DD/YY	8 char
171-174	Total amount of data for instrument 6 for orbit	dddd	4 char
175-178	Total number of instances of "no data avail" for instrument 6 for orbit	dddd	4 char
179-182	Name of instrument 7	aaaa	4 char

183-184	Number of variables for instrument 7	dd	2 char
185-192	Last date data entered for instrument 7-orbit	MM/DD/YY	8 char
193-196	Total amount of data for instrument 7 for orbit	dddd	4 char
197-200	Total number of instances of "no data avail" for instrument 7 for orbit	dddd	4 char
201-204	Name of instrument 8	aaaa	4 char
205-206	Number of variables for instrument 8	dd	2 char
207-214	Last date data entered for instrument 8-orbit	MM/DD/YY	8 char
215-218	Total amount of data for instrument 8 for orbit	dddd	4 char
219-222	Total number of instances of "no data avail" for instrument 8 for orbit	dddd	4 char
223-226	Name of instrument 9	aaaa	4 char
227-228	Number of variables for instrument 9	dd	2 char
229-236	Last date data entered for instrument 9-orbit	MM/DD/YY	8 char
237-240	Total amount of data for instrument 9 for orbit	dddd	4 char
241-244	Total number of instances of "no data avail" for instrument 9 for orbit	dddd	4 char
245-248	Name of instrument 10	aaaa	4 char
249-250	Number of variables for instrument 10	dd	2 char
251-258	Last date data entered for instrument 10-orbit	MM/DD/YY	8 char
259-262	Total amount of data for instrument 10	dddd	4 char
263-266	Total number of instances of "no data avail" for instrument 10 for orbit	dddd	4 char

FILE 3 - DATA FILE

This file consists of 37,625 376-byte logical records. The logical records are packed ten to a physical record. There are 301 logical records for each of the 125 orbits. These records contain the processed orbital data centered around periapsis sampled at approximately 12-second intervals.

Logical records 1 through 301, inclusive, contain the data for orbit 487. Logical records 302 through 602, inclusive, contain the data for orbit 488, etc.

The first logical record for each orbit contains the data for all of the instruments' variables sampled at the UT start time specified for the orbit in its status record (File 2). The orbit's second logical record contains the instruments' variables' data sampled 12 seconds after the UT start time. The orbit's third logical record contains the instruments' variables' data sampled 24 seconds after the UT time, etc. The one hundred and fifty-first logical record for an orbit contains the variables' data sampled at the time of periapsis, as specified in the orbit's status record. Due to the characteristics of the available unprocessed data, there may not exist a 12 second interval between the sampling times of the periapsis data in logical record 151 and the data in logical records 150 and 152 for an orbit. However, there will be 12 second intervals between the sampling times of the data in an orbit's records 152 through 301. Therefore, the sampling time of each of an orbit's records may be calculated from the UT start, UT periapsis, and UT stop times in the orbit's status record. It is also available in each record's UTMS and UTYD variables.

Two special values were reserved to indicate the two possible null data conditons. When the LFD data base was initialized, all of the variables' values were set to hexadecimal X'FFFFFFFF' indicating an un-updated null data condition. The second special null data value is a hexadecimal X'7FFFFFFF'. It is used to indicate that data will never be available for a variable for the orbit and sampling time, e.g., when an instrument was turned off during an orbit. All other values found in the data file can be interpreted as actual data.

The order of the instruments' variables' data and their formats in the records of the third file are listed below. Note that the first four bytes of a data record act as a key, giving the record's orbit and nominal time relative to periapsis. A brief description of each of the listed variables can be found in Attachment 2.

PV Tape No. 011 (Contd)

BYTES 001-004 KEY FIELD CONSISTING OF:
- BYTES 001-002 BINARY ORBIT NUMBER
- BYTES 003-004 BINARY 12 SECOND TIME INTERVAL -1800,-1788,...1788,1800
- BYTES 005-008 AMV BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
- BYTES 009-012 ATTX BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
- BYTES 013-016 ATTY BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
- BYTES 017-020 ATTZ BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
- BYTES 021-024 BMAG BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
- BYTES 025-028 BXSC BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
- BYTES 029-032 BYSC BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
- BYTES 033-036 BZSC BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
- BYTES 037-040 COL BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
- BYTES 041-044 DBTL BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
- BYTES 045-048 DBTR BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
- BYTES 049-052 DCO BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
- BYTES 053-056 DCO2 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
- BYTES 057-060 DHE BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
- BYTES 061-064 DN2 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
- BYTES 065-068 DO BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
- BYTES 069-072 DXP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
- BYTES 073-076 DYP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
- BYTES 077-080 DZP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
- BYTES 081-084 ELNE BELONGING TO THE OETP INSTR IN FLOATING PT FORMAT
- BYTES 085-088 ELTE BELONGING TO THE OETP INSTR IN FLOATING PT FORMAT
- BYTES 089-092 EMAG BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT
- BYTES 093-096 ETEM BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
- BYTES 097-100 I001 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
- BYTES 101-104 I002 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
- BYTES 105-108 I004 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
- BYTES 109-112 I008 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
- BYTES 113-116 I012 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
- BYTES 117-120 I014 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
- BYTES 121-124 I016 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
- BYTES 125-128 I017 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
- BYTES 129-132 I018 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
- BYTES 133-136 I024 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
- BYTES 137-140 I028 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
- BYTES 141-144 I030 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
- BYTES 145-148 I032 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
- BYTES 149-152 I040 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
- BYTES 153-156 I044 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
- BYTES 157-160 I056 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
- BYTES 161-164 LATP BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
- BYTES 165-168 LONP BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
- BYTES 169-172 MAGR BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
- BYTES 173-176 MI BELONGING TO THE OETP INSTR IN FLOATING PT FORMAT
- BYTES 177-180 MONE BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
- BYTES 181-184 MTWO BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
- BYTES 185-188 MVE BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
- BYTES 189-192 NONE BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
- BYTES 193-196 NTOT BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
- BYTES 197-200 NTWO BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
- BYTES 201-204 NVR1 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
- BYTES 205-208 NVR2 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT

BYTES 209-212 NVR3 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 213-216 NVR4 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 217-220 NVR5 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 221-224 PBSP BELONGING TO THE OPA INSTR IN FLOATING PT FORMAT
BYTES 225-228 PFLX BELONGING TO THE OPA INSTR IN FLOATING PT FORMAT
BYTES 229-232 RLAT BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 233-236 RLON BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 237-240 RRAD BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 241-244 RRHO BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 245-248 SHA BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 249-252 SHT BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 253-256 SLOP BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 257-260 SPIN BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 261-264 SPOT BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 265-268 SPR1 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 269-272 SPR2 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 273-276 SZA BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 277-280 TONE BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 281-284 TTWO BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 285-288 UTMS BELONGING TO THE SEDR INSTR IN FIXED DECIMLFORMAT
BYTES 289-292 UTYD BELONGING TO THE SEDR INSTR IN FIXED DECIMLFORMAT
BYTES 293-296 VES BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 297-300 VS BELONGING TO THE OETP INSTR IN FLOATING PT FORMAT
BYTES 301-304 VVR1 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 305-308 VVR2 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 309-312 VVR3 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 313-316 VVR4 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 317-320 VVR5 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 321-324 WVL BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 325-328 XP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 329-332 XS1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 333-336 XVEL BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 337-340 YP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 341-344 YS1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 345-348 YVEL BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 349-352 ZP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 353-356 ZS1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 357-360 ZVEL BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 361-364 100H BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT
BYTES 365-368 31KH BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT
BYTES 369-372 54KH BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT
BYTES 373-376 730H BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT

FORMAT OF PIONEER 12 LOW FREQUENCY DATA (LFD) TAPE 012

The Pioneer Venus Low Frequency Data Tape 012 contains the Pioneer Venus orbiting spacecraft's processed Low Frequency Data for Orbits 612 through 737, excluding orbit 708. Tracking was unavailable for orbit 708 during the periapsis-centered time interval spanned by the LFD system. Therefore, no data exists for that orbit. The data has been recorded on a 9-track tape at a 800 bpi density. Since this tape was created on an IBM machine, the EBCDIC character set and IBM floating point number format were used where applicable. There are three files on this tape. Each file is followed by a single end-of-file mark. These files in the order of their occurrence are:

FILE 1 - TAPE DESCRIPTION FILE

This file consists of 120 80-character records. Its purpose is to provide a readily available description of the data contained in the tape's second and third files. The file is blocked one logical record per physical record and is wholly comprised of printable EBCDIC characters. See Attachment 1 for a printed copy of this file's contents.

FILE 2 - STATUS FILE

This file consists of 125 266-character records. There is one record for each of the 125 orbits included on this tape. All data is in EBCDIC, printable characters. The data included in each record is as follows:

Bytes	Data	Format	
1-4	Number of orbit described by this record	dddd	4 char
5-10	Date of orbit	yy:DOY	6 char
11-22	UT start time of data included for orbit	HH:MM:SS.MIL	12 char
23-34	UT stop time of data included for orbit	HH:MM:SS.MIL	12 char
35-46	UT of orbit's periapsis	HH:MM:SS.MIL	12 char
47-50	Name of instrument 1	aaaa	4 char
51-52	Number of variables for instrument 1	dd	2 char
53-60	Last date data entered for instrument 1-orbit	MM/DD/YY	8 char
61-64	Total amount of data for instrument 1 for orbit	dddd	4 char
65-68	Total number of instances of "no data avail" for instrument 1 for orbit	dddd	4 char
69-72	Name of instrument 2	aaaa	4 char
73-74	Number of variables for instrument 2	dd	2 char

PV Tape no. 12

75-82	Last date data entered for instrument 2-orbit	MM/DD/YY	8 char
83-86	Total amount of data for instrument 2 for orbit	dddd	4 char
87-90	Total number of instances of "no data avail" for instrument 2 for orbit	dddd	4 char
91-94	Name of instrument 3	aaaa	4 char
95-96	Number of variables for instrument 3	dd	2 char
97-104	Last date data entered for instrument 3-orbit	MM/DD/YY	8 char
105-108	Total amount of data for instrument 3 for orbit	dddd	4 char
109-112	Total number of instances of "no data avail" for instrument 3 for orbit	dddd	4 char
113-116	Name of instrument 4	aaaa	4 char
117-118	Number of variables for instrument 4	dd	2 char
119-126	Last date data entered for instrument 4-orbit	MM/DD/YY	8 char
127-130	Total amount of data for instrument 4 for orbit	dddd	4 char
131-134	Total number of instances of "no data avail" for instrument 4 for orbit	dddd	4 char
135-138	Name of instrument 5	aaaa	4 char
139-140	Number of variables for instrument 5	dd	2 char
141-148	Last date data entered for instrument 5-orbit	MM/DD/YY	8 char
149-152	Total amount of data for instrument 5 for orbit	dddd	4 char
153-156	Total number of instances of "no data avail" for instrument 5 for orbit	dddd	4 char
157-160	Name of instrument 6	aaaa	4 char
161-162	Number of variables for instrument 6	dd	2 char
163-170	Last date data entered for instrument 6-orbit	MM/DD/YY	8 char
171-174	Total amount of data for instrument 6 for orbit	dddd	4 char
175-178	Total number of instances of "no data avail" for instrument 6 for orbit	dddd	4 char
179-182	Name of instrument 7	aaaa	4 char

183-184	Number of variables for instrument 7	dd	2 char
185-192	Last date data entered for instrument 7-orbit	MM/DD/YY	8 char
193-196	Total amount of data for instrument 7 for orbit	dddd	4 char
197-200	Total number of instances of "no data avail" for instrument 7 for orbit	dddd	4 char
201-204	Name of instrument 8	aaaa	4 char
205-206	Number of variables for instrument 8	dd	2 char
207-214	Last date data entered for instrument 8-orbit	MM/DD/YY	8 char
215-218	Total amount of data for instrument 8 for orbit	dddd	4 char
219-222	Total number of instances of "no data avail" for instrument 8 for orbit	dddd	4 char
223-226	Name of instrument 9	aaaa	4 char
227-228	Number of variables for instrument 9	dd	2 char
229-236	Last date data entered for instrument 9-orbit	MM/DD/YY	8 char
237-240	Total amount of data for instrument 9 for orbit	dddd	4 char
241-244	Total number of instances of "no data avail" for instrument 9 for orbit	dddd	4 char
245-248	Name of instrument 10	aaaa	4 char
249-250	Number of variables for instrument 10	dd	2 char
251-258	Last date data entered for instrument 10-orbit	MM/DD/YY	8 char
259-262	Total amount of data for instrument 10	dddd	4 char
263-266	Total number of instances of "no data avail" for instrument 10 for orbit	dddd	4 char

FILE 3 - DATA FILE

This file consists of 37,625 376-byte logical records. The logical records are packed ten to a physical record. There are 301 logical records for each of the 125 orbits. These records contain the processed orbital data centered around periapsis sampled at approximately 12-second intervals.

Logical records 1 through 301, inclusive, contain the data for orbit 612. Logical records 302 through 602, inclusive, contain the data for orbit 613, etc.

The first logical record for each orbit contains the data for all of the

instruments' variables sampled at the UT start time specified for the orbit in its status record (File 2). The orbit's second logical record contains the instruments' variables' data sampled 12 seconds after the UT start time. The orbit's third logical record contains the instruments' variables' data sampled 24 seconds after the UT time, etc. The one hundred and fifty-first logical record for an orbit contains the variables' data sampled at the time of periapsis, as specified in the orbit's status record. Due to the characteristics of the available unprocessed data, there may not exist a 12 second interval between the sampling times of the periapsis data in logical record 151 and the data in logical records 150 and 152 for an orbit. However, there will be 12 second intervals between the sampling times of the data in an orbit's records 152 through 301. Therefore, the sampling time of each of an orbit's records may be calculated from the UT start, UT periapsis, and UT stop times in the orbit's status record. It is also available in each record's UTMS and UTYD variables.

Two special values were reserved to indicate the two possible null data conditons. When the LFD data base was initialized, all of the variables' values were set to hexadecimal X'FFFFFFFF' indicating an un-updated null data condition. The second special null data value is a hexadecimal X'7FFFFFFF'. It is used to indicate that data will never be available for a variable for the orbit and sampling time, e.g., when an instrument was turned off during an orbit. All other values found in the data file can be interpreted as actual data.

The order of the instruments' variables' data and their formats in the records of the third file are listed below. Note that the first four bytes of a data record act as a key, giving the record's orbit and nominal time relative to periapsis. A brief description of each of the listed variables can be found in Attachment 2.

BYTES 001-004 KEY FIELD CONSISTING OF:
BYTES 001-002 BINARY ORBIT NUMBER
BYTES 003-004 BINARY 12 SECOND TIME INTERVAL -1800,-1788,...1783,1800
BYTES 005-008 AMV BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 009-012 ATTX BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 013-016 ATTY BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 017-020 ATTZ BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 021-024 BMAG BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 025-028 BXSC BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 029-032 BYSC BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 033-036 BZSC BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 037-040 COL BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 041-044 DBTL BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 045-048 DBTR BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 049-052 DCO BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 053-056 DCO2 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 057-060 DHE BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 061-064 DN2 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 065-068 DO BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 069-072 DXP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 073-076 DYP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 077-080 DZP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 081-084 ELNE BELONGING TO THE OETP INSTR IN FLOATING PT FORMAT
BYTES 085-088 ELTE BELONGING TO THE OETP INSTR IN FLOATING PT FORMAT
BYTES 089-092 EMAG BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT
BYTES 093-096 ETEM BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 097-100 I001 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 101-104 I002 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 105-108 I004 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 109-112 I008 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 113-116 I012 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 117-120 I014 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 121-124 I016 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 125-128 I017 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 129-132 I018 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 133-136 I024 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 137-140 I028 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 141-144 I030 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 145-148 I032 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 149-152 I040 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 153-156 I044 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 157-160 I056 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 161-164 LATP BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 165-168 LONP BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 169-172 MAGR BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 173-176 MI BELONGING TO THE OETP INSTR IN FLOATING PT FORMAT
BYTES 177-180 MONE BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 181-184 MTWO BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 185-188 MVE BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 189-192 NONE BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 193-196 NTOT BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 197-200 NTWO BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 201-204 NVR1 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 205-208 NVR2 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT

BYTES 209-212 NVR3 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 213-216 NVR4 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 217-220 NVR5 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 221-224 PBSP BELONGING TO THE OPA INSTR IN FLOATING PT FORMAT
BYTES 225-228 PFLX BELONGING TO THE OPA INSTR IN FLOATING PT FORMAT
BYTES 229-232 RLAT BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 233-236 RLON BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 237-240 RRAD BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 241-244 RRHO BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 245-248 SHA BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 249-252 SHT BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 253-256 SLOP BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 257-260 SPIN BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 261-264 SPOT BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 265-268 SPR1 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 269-272 SPR2 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 273-276 SZA BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 277-280 TONE BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 281-284 TTWO BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 285-288 UTMS BELONGING TO THE SEDR INSTR IN FIXED DECIMLFORMAT
BYTES 289-292 UTYD BELONGING TO THE SEDR INSTR IN FIXED DECIMLFORMAT
BYTES 293-296 VES BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 297-300 VS BELONGING TO THE OETP INSTR IN FLOATING PT FORMAT
BYTES 301-304 VVR1 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 305-308 VVR2 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 309-312 VVR3 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 313-316 VVR4 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 317-320 VVR5 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 321-324 WVL BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 325-328 XP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 329-332 XS1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 333-336 XVEL BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 337-340 YP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 341-344 YS1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 345-348 YVEL BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 349-352 ZP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 353-356 ZS1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 357-360 ZVEL BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 361-364 100H BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT
BYTES 365-368 31KH BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT
BYTES 369-372 54KH BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT
BYTES 373-376 730H BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT

FORMAT OF PIONEER 12 LOW FREQUENCY DATA (LFD) TAPE 013

The Pioneer Venus Low Frequency Data Tape 013 contains the Pioneer Venus orbiting spacecraft's processed Low Frequency Data for Orbits 738 through 892, excluding orbits 836 to 865, inclusive. The Pioneer Venus spacecraft was in superior conjunction during orbit 836 through 865; hence there is no data available for those orbits. The data has been recorded on a 9-track tape at a 800 bpi density. Since this tape was created on an IBM machine, the EBCDIC character set and IBM floating point number format were used where applicable. There are three files on this tape. Each file is followed by a single end-of-file mark. These files in the order of their occurrence are:

FILE 1 - TAPE DESCRIPTION FILE

This file consists of 120 80-character records. Its purpose is to provide a readily available description of the data contained in the tape's second and third files. The file is blocked one logical record per physical record and is wholly comprised of printable EBCDIC characters. See Attachment 1 for a printed copy of this file's contents.

FILE 2 - STATUS FILE

This file consists of 125 266-character records. There is one record for each of the 125 orbits included on this tape. All data is in EBCDIC, printable characters. The data included in each record is as follows:

Bytes	Data	Format	
1-4	Number of orbit described by this record	dddd	4 char
5-10	Date of orbit	yy:DOY	6 char
11-22	UT start time of data included for orbit	HH:MM:SS.MIL	12 char
23-34	UT stop time of data included for orbit	HH:MM:SS.MIL	12 char
35-46	UT of orbit's periapsis	HH:MM:SS.MIL	12 char
47-50	Name of instrument 1	aaaa	4 char
51-52	Number of variables for instrument 1	dd	2 char
53-60	Last date data entered for instrument 1-orbit	MM/DD/YY	8 char
61-64	Total amount of data for instrument 1 for orbit	dddd	4 char
65-68	Total number of instances of "no data avail" for instrument 1 for orbit	dddd	4 char
69-72	Name of instrument 2	aaaa	4 char
73-74	Number of variables for instrument 2	dd	2 char

PV Tape no. 13

75-82	Last date data entered for instrument 2-orbit	MM/DD/YY	8 char
83-86	Total amount of data for instrument 2 for orbit	dddd	4 char
87-90	Total number of instances of "no data avail" for instrument 2 for orbit	dddd	4 char
91-94	Name of instrument 3	aaaa	4 char
95-96	Number of variables for instrument 3	dd	2 char
97-104	Last date data entered for instrument 3-orbit	MM/DD/YY	8 char
105-108	Total amount of data for instrument 3 for orbit	dddd	4 char
109-112	Total number of instances of "no data avail" for instrument 3 for orbit	dddd	4 char
113-116	Name of instrument 4	aaaa	4 char
117-118	Number of variables for instrument 4	dd	2 char
119-126	Last date data entered for instrument 4-orbit	MM/DD/YY	8 char
127-130	Total amount of data for instrument 4 for orbit	dddd	4 char
131-134	Total number of instances of "no data avail" for instrument 4 for orbit	dddd	4 char
135-138	Name of instrument 5	aaaa	4 char
139-140	Number of variables for instrument 5	dd	2 char
141-148	Last date data entered for instrument 5-orbit	MM/DD/YY	8 char
149-152	Total amount of data for instrument 5 for orbit	dddd	4 char
153-156	Total number of instances of "no data avail" for instrument 5 for orbit	dddd	4 char
157-160	Name of instrument 6	aaaa	4 char
161-162	Number of variables for instrument 6	dd	2 char
163-170	Last date data entered for instrument 6-orbit	MM/DD/YY	8 char
171-174	Total amount of data for instrument 6 for orbit	dddd	4 char
175-178	Total number of instances of "no data avail" for instrument 6 for orbit	dddd	4 char
179-182	Name of instrument 7	aaaa	4 char

183-184	Number of variables for instrument 7	dd	2 char
185-192	Last date data entered for instrument 7-orbit	MM/DD/YY	8 char
193-196	Total amount of data for instrument 7 for orbit	dddd	4 char
197-200	Total number of instances of "no data avail" for instrument 7 for orbit	dddd	4 char
201-204	Name of instrument 8	aaaa	4 char
205-206	Number of variables for instrument 8	dd	2 char
207-214	Last date data entered for instrument 8-orbit	MM/DD/YY	8 char
215-218	Total amount of data for instrument 8 for orbit	dddd	4 char
219-222	Total number of instances of "no data avail" for instrument 8 for orbit	dddd	4 char
223-226	Name of instrument 9	aaaa	4 char
227-228	Number of variables for instrument 9	dd	2 char
229-236	Last date data entered for instrument 9-orbit	MM/DD/YY	8 char
237-240	Total amount of data for instrument 9 for orbit	dddd	4 char
241-244	Total number of instances of "no data avail" for instrument 9 for orbit	dddd	4 char
245-248	Name of instrument 10	aaaa	4 char
249-250	Number of variables for instrument 10	dd	2 char
251-258	Last date data entered for instrument 10-orbit	MM/DD/YY	8 char
259-262	Total amount of data for instrument 10	dddd	4 char
263-266	Total number of instances of "no data avail" for instrument 10 for orbit	dddd	4 char

FILE 3 - DATA FILE

This file consists of 37,625 376-byte logical records. The logical records are packed ten to a physical record. There are 301 logical records for each of the 125 orbits. These records contain the processed orbital data centered around periapsis sampled at approximately 12-second intervals.

Logical records 1 through 301, inclusive, contain the data for orbit 738. Logical records 302 through 602, inclusive, contain the data for orbit 739, etc.

The first logical record for each orbit contains the data for all of the instruments' variables sampled at the UT start time specified for the orbit in its status record (File 2). The orbit's second logical record contains the instruments' variables' data sampled 12 seconds after the UT start time. The orbit's third logical record contains the instruments' variables' data sampled 24 seconds after the UT time, etc. The one hundred and fifty-first logical record for an orbit contains the variables' data sampled at the time of periapsis, as specified in the orbit's status record. Due to the characteristics of the available unprocessed data, there may not exist a 12 second interval between the sampling times of the periapsis data in logical record 151 and the data in logical records 150 and 152 for an orbit. However, there will be 12 second intervals between the sampling times of the data in an orbit's records 152 through 301. Therefore, the sampling time of each of an orbit's records may be calculated from the UT start, UT periapsis, and UT stop times in the orbit's status record. It is also available in each record's UTMS and UTYD variables.

Two special values were reserved to indicate the two possible null data conditons. When the LFD data base was initialized, all of the variables' values were set to hexadecimal X'FFFFFFFF' indicating an un-updated null data condition. The second special null data value is a hexadecimal X'7FFFFFFF'. It is used to indicate that data will never be available for a variable for the orbit and sampling time, e.g., when an instrument was turned off during an orbit. All other values found in the data file can be interpreted as actual data.

The order of the instruments' variables' data and their formats in the records of the third file are listed below. Note that the first four bytes of a data record act as a key, giving the record's orbit and nominal time relative to periapsis. A brief description of each of the listed variables can be found in Attachment 2.

PV Tape No. 013 (Contd)

BYTES 001-004 KEY FIELD CONSISTING OF:

BYTES 001-002 BINARY ORBIT NUMBER
BYTES 003-004 BINARY 12 SECOND TIME INTERVAL -1800,-1788,...1788,1800
BYTES 005-008 AMV BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 009-012 ATTX BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 013-016 ATTY BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 017-020 ATTZ BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 021-024 BMAG BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 025-028 BXSC BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 029-032 BYSC BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 033-036 BZSC BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 037-040 COL BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 041-044 DBTL BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 045-048 DBTR BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 049-052 DCO BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 053-056 DCO2 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 057-060 DHE BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 061-064 DN2 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 065-068 DO BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 069-072 DXP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 073-076 DYP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 077-080 DZP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 081-084 ELNE BELONGING TO THE OETP INSTR IN FLOATING PT FORMAT
BYTES 085-088 ELTE BELONGING TO THE OETP INSTR IN FLOATING PT FORMAT
BYTES 089-092 EMAG BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT
BYTES 093-096 ETEM BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 097-100 I001 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 101-104 I002 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 105-108 I004 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 109-112 I008 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 113-116 I012 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 117-120 I014 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 121-124 I016 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 125-128 I017 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 129-132 I018 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 133-136 I024 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 137-140 I028 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 141-144 I030 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 145-148 I032 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 149-152 I040 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 153-156 I044 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 157-160 I056 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 161-164 LATP BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 165-168 LONP BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 169-172 MAGR BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 173-176 MI BELONGING TO THE OETP INSTR IN FLOATING PT FORMAT
BYTES 177-180 MONE BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 181-184 MTWO BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 185-188 MVE BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 189-192 NONE BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 193-196 NTOT BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 197-200 NTWO BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 201-204 NVR1 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 205-208 NVR2 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT

BYTES 209-212 NVR3 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 213-216 NVR4 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 217-220 NVR5 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 221-224 PBSP BELONGING TO THE OPA INSTR IN FLOATING PT FORMAT
BYTES 225-228 PFLX BELONGING TO THE OPA INSTR IN FLOATING PT FORMAT
BYTES 229-232 RLAT BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 233-236 RLON BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 237-240 RRAD BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 241-244 RRHO BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 245-248 SHA BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 249-252 SHT BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 253-256 SLOP BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 257-260 SPIN BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 261-264 SPOT BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 265-268 SPR1 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 269-272 SPR2 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 273-276 SZA BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 277-280 TONE BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 281-284 TTWO BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 285-288 UTMS BELONGING TO THE SEDR INSTR IN FIXED DECIMLFORMAT
BYTES 289-292 UTYD BELONGING TO THE SEDR INSTR IN FIXED DECIMLFORMAT
BYTES 293-296 VES BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 297-300 VS BELONGING TO THE OETP INSTR IN FLOATING PT FORMAT
BYTES 301-304 VVR1 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 305-308 VVR2 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 309-312 VVR3 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 313-316 VVR4 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 317-320 VVR5 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 321-324 WVL BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 325-328 XP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 329-332 XS1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 333-336 XVEL BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 337-340 YP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 341-344 YS1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 345-348 YVEL BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 349-352 ZP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 353-356 ZS1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 357-360 ZVEL BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 361-364 100H BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT
BYTES 365-368 31KH BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT
BYTES 369-372 54KH BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT
BYTES 373-376 730H BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT

FORMAT OF PIONEER 12 LOW FREQUENCY DATA (LFD) TAPE 014

The Pioneer Venus Low Frequency Data Tape 014 contains the Pioneer Venus orbiting spacecraft's processed Low Frequency Data for Orbits 893 through 1017. The data has been recorded on a 9-track tape at a 800 bpi density. Since this tape was created on an IBM machine, the EBCDIC character set and IBM floating point number format were used where applicable. There are three files on this tape. Each file is followed by a single end-of-file mark. These files in the order of their occurrence are:

FILE 1 - TAPE DESCRIPTION FILE

This file consists of 120 80-character records. Its purpose is to provide a readily available description of the data contained in the tape's second and third files. The file is blocked one logical record per physical record and is wholly comprised of printable EBCDIC characters. See Attachment 1 for a printed copy of this file's contents.

FILE 2 - STATUS FILE

This file consists of 125 266-character records. There is one record for each of the 125 orbits included on this tape. All data is in EBCDIC, printable characters. The data included in each record is as follows:

Bytes	Data	Format	
1-4	Number of orbit described by this record	dddd	4 char
5-10	Date of orbit	yy:DOY	6 char
11-22	UT start time of data included for orbit	HH:MM:SS.MIL	12 char
23-34	UT stop time of data included for orbit	HH:MM:SS.MIL	12 char
35-46	UT of orbit's periapsis	HH:MM:SS.MIL	12 char
47-50	Name of instrument 1	aaaa	4 char
51-52	Number of variables for instrument 1	dd	2 char
53-60	Last date data entered for instrument 1-orbit	MM/DD/YY	8 char
61-64	Total amount of data for instrument 1 for orbit	dddd	4 char
65-68	Total number of instances of "no data avail" for instrument 1 for orbit	dddd	4 char
69-72	Name of instrument 2	aaaa	4 char
73-74	Number of variables for instrument 2	dd	2 char
75-82	Last date data entered for instrument 2-orbit	MM/DD/YY	8 char

83-86	Total amount of data for instrument 2 for orbit	dddd	4 char
87-90	Total number of instances of "no data avail" for instrument 2 for orbit	dddd	4 char
91-94	Name of instrument 3	aaaa	4 char
95-96	Number of variables for instrument 3	dd	2 char
97-104	Last date data entered for instrument 3-orbit	MM/DD/YY	8 char
105-108	Total amount of data for instrument 3 for orbit	dddd	4 char
109-112	Total number of instances of "no data avail" for instrument 3 for orbit	dddd	4 char
113-116	Name of instrument 4	aaaa	4 char
117-118	Number of variables for instrument 4	dd	2 char
119-126	Last date data entered for instrument 4-orbit	MM/DD/YY	8 char
127-130	Total amount of data for instrument 4 for orbit	dddd	4 char
131-134	Total number of instances of "no data avail" for instrument 4 for orbit	dddd	4 char
135-138	Name of instrument 5	aaaa	4 char
139-140	Number of variables for instrument 5	dd	2 char
141-148	Last date data entered for instrument 5-orbit	MM/DD/YY	8 char
149-152	Total amount of data for instrument 5 for orbit	dddd	4 char
153-156	Total number of instances of "no data avail" for instrument 5 for orbit	dddd	4 char
157-160	Name of instrument 6	aaaa	4 char
161-162	Number of variables for instrument 6	dd	2 char
163-170	Last date data entered for instrument 6-orbit	MM/DD/YY	8 char
171-174	Total amount of data for instrument 6 for orbit	dddd	4 char
175-178	Total number of instances of "no data avail" for instrument 6 for orbit	dddd	4 char
179-182	Name of instrument 7	aaaa	4 char
183-184	Number of variables for instrument 7	dd	2 char

185-192	Last date data entered for instrument 7-orbit	MM/DD/YY	8 char
193-196	Total amount of data for instrument 7 for orbit	dddd	4 char
197-200	Total number of instances of "no data avail" for instrument 7 for orbit	dddd	4 char
201-204	Name of instrument 8	aaaa	4 char
205-206	Number of variables for instrument 8	dd	2 char
207-214	Last date data entered for instrument 8-orbit	MM/DD/YY	8 char
215-218	Total amount of data for instrument 8 for orbit	dddd	4 char
219-222	Total number of instances of "no data avail" for instrument 8 for orbit	dddd	4 char
223-226	Name of instrument 9	aaaa	4 char
227-228	Number of variables for instrument 9	dd	2 char
229-236	Last date data entered for instrument 9-orbit	MM/DD/YY	8 char
237-240	Total amount of data for instrument 9 for orbit	dddd	4 char
241-244	Total number of instances of "no data avail" for instrument 9 for orbit	dddd	4 char
245-248	Name of instrument 10	aaaa	4 char
249-250	Number of variables for instrument 10	dd	2 char
251-258	Last date data entered for instrument 10-orbit	MM/DD/YY	8 char
259-262	Total amount of data for instrument 10	dddd	4 char
263-266	Total number of instances of "no data avail" for instrument 10 for orbit	dddd	4 char

FILE 3 - DATA FILE

This file consists of 37,625 376-byte logical records. The logical records are packed ten to a physical record. There are 301 logical records for each of the 125 orbits. These records contain the processed orbital data centered around periapsis sampled at approximately 12-second intervals.

Logical records 1 through 301, inclusive, contain the data for orbit 893. Logical records 302 through 602, inclusive, contain the data for orbit 894, etc.

The first logical record for each orbit contains the data for all of the instruments' variables sampled at the UT start time specified for the orbit in its status record (File 2). The orbit's second logical record contains the

instruments' variables' data sampled 12 seconds after the UT start time. The orbit's third logical record contains the instruments' variables' data sampled 24 seconds after the UT time, etc. The one hundred and fifty-first logical record for an orbit contains the variables' data sampled at the time of periapsis, as specified in the orbit's status record. Due to the characteristics of the available unprocessed data, there may not exist a 12 second interval between the sampling times of the periapsis data in logical record 151 and the data in logical records 150 and 152 for an orbit. However, there will be 12 second intervals between the sampling times of the data in an orbit's records 152 through 301. Therefore, the sampling time of each of an orbit's records may be calculated from the UT start, UT periapsis, and UT stop times in the orbit's status record. It is also available in each record's UTMS and UTYD variables.

Two special values were reserved to indicate the two possible null data conditons. When the LFD data base was initialized, all of the variables' values were set to hexadecimal X'FFFFFFFF' indicating an un-updated null data condition. The second special null data value is a hexadecimal X'7FFFFFFF'. It is used to indicate that data will never be available for a variable for the orbit and sampling time, e.g., when an instrument was turned off during an orbit. All other values found in the data file can be interpreted as actual data.

The order of the instruments' variables' data and their formats in the records of the third file are listed below. Note that the first four bytes of a data record act as a key, giving the record's orbit and nominal time relative to periapsis. A brief description of each of the listed variables can be found in Attachment 2.

BYTES 001-004 KEY FIELD CONSISTING OF:
BYTES 001-002 BINARY ORBIT NUMBER
BYTES 003-004 BINARY 12 SECOND TIME INTERVAL -1800,-1788,...1788,1800
BYTES 005-008 AMV BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 009-012 ATTX BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 013-016 ATTY BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 017-020 ATTZ BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 021-024 BMAG BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 025-028 BXSC BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 029-032 BYSC BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 033-036 BZSC BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 037-040 COL BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 041-044 DBTL BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 045-048 DBTR BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 049-052 DCO BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 053-056 DCO2 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 057-060 DHE BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 061-064 DN2 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 065-068 DO BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 069-072 DXP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 073-076 DYP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 077-080 DZP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 081-084 ELNE BELONGING TO THE OETP INSTR IN FLOATING PT FORMAT
BYTES 085-088 ELTE BELONGING TO THE OETP INSTR IN FLOATING PT FORMAT
BYTES 089-092 EMAG BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT
BYTES 093-096 ETEM BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 097-100 I001 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 101-104 I002 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 105-108 I004 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 109-112 I008 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 113-116 I012 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 117-120 I014 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 121-124 I016 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 125-128 I017 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 129-132 I018 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 133-136 I024 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 137-140 I028 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 141-144 I030 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 145-148 I032 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 149-152 I040 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 153-156 I044 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 157-160 I056 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 161-164 LATP BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 165-168 LONP BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 169-172 MAGR BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 173-176 MI BELONGING TO THE OETP INSTR IN FLOATING PT FORMAT
BYTES 177-180 MONE BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 181-184 MTWO BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 185-188 MVE BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 189-192 NONE BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 193-196 NTOT BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 197-200 NTWO BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 201-204 NVR1 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 205-208 NVR2 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT

BYTES 209-212 NVR3 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 213-216 NVR4 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 217-220 NVR5 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 221-224 PBSP BELONGING TO THE OPA INSTR IN FLOATING PT FORMAT
BYTES 225-228 PFLX BELONGING TO THE OPA INSTR IN FLOATING PT FORMAT
BYTES 229-232 RLAT BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 233-236 RLON BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 237-240 RRAD BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 241-244 RRHO BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 245-248 SHA BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 249-252 SHT BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 253-256 SLOP BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 257-260 SPIN BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 261-264 SPOT BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 265-268 SPR1 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 269-272 SPR2 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 273-276 SZA BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 277-280 TONE BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 281-284 TTWO BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 285-288 UTMS BELONGING TO THE SEDR INSTR IN FIXED DECIMLFORMAT
BYTES 289-292 UTYD BELONGING TO THE SEDR INSTR IN FIXED DECIMLFORMAT
BYTES 293-296 VES BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 297-300 VS BELONGING TO THE OETP INSTR IN FLOATING PT FORMAT
BYTES 301-304 VVR1 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 305-308 VVR2 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 309-312 VVR3 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 313-316 VVR4 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 317-320 VVR5 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 321-324 WVL BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 325-328 XP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 329-332 XS1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 333-336 XVEL BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 337-340 YP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 341-344 YS1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 345-348 YVEL BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 349-352 ZP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 353-356 ZS1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 357-360 ZVEL BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 361-364 100H BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT
BYTES 365-368 31KH BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT
BYTES 369-372 54KH BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT
BYTES 373-376 730H BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT

FORMAT OF PIONEER 12 LOW FREQUENCY DATA (LFD) TAPE 015

The Pioneer Venus Low Frequency Data Tape 015 contains the Pioneer Venus orbiting spacecraft's processed Low Frequency Data for Orbits 1018 through 1086. The data has been recorded on a 9-track tape at a 800 bpi density. Since this tape was created on an IBM machine, the EBCDIC character set and IBM floating point number format were used where applicable. There are three files on this tape. Each file is followed by a single end-of-file mark. These files in the order of their occurrence are:

FILE 1 - TAPE DESCRIPTION FILE

This file consists of 120 80-character records. Its purpose is to provide a readily available description of the data contained in the tape's second and third files. The file is blocked one logical record per physical record and is wholly comprised of printable EBCDIC characters. See Attachment 1 for a printed copy of this file's contents.

FILE 2 - STATUS FILE

This file consists of 69 266-character records. There is one record for each of the 69 orbits included on this tape. All data is in EBCDIC, printable characters. The data included in each record is as follows:

Bytes	Data	Format	
1-4	Number of orbit described by this record	dddd	4 char
5-10	Date of orbit	yy:DOY	6 char
11-22	UT start time of data included for orbit	HH:MM:SS.MIL	12 char
23-34	UT stop time of data included for orbit	HH:MM:SS.MIL	12 char
35-46	UT of orbit's periapsis	HH:MM:SS.MIL	12 char
47-50	Name of instrument 1	aaaa	4 char
51-52	Number of variables for instrument 1	dd	2 char
53-60	Last date data entered for instrument 1-orbit	MM/DD/YY	8 char
61-64	Total amount of data for instrument 1 for orbit	dddd	4 char
65-68	Total number of instances of "no data avail" for instrument 1 for orbit	dddd	4 char
69-72	Name of instrument 2	aaaa	4 char
73-74	Number of variables for instrument 2	dd	2 char
75-82	Last date data entered for instrument 2-orbit	MM/DD/YY	8 char
83-86	Total amount of data for instrument 2 for orbit	dddd	4 char

87-90	Total number of instances of "no data avail" for instrument 2 for orbit	dddd	4 char
91-94	Name of instrument 3	aaaa	4 char
95-96	Number of variables for instrument 3	dd	2 char
97-104	Last date data entered for instrument 3-orbit	MM/DD/YY	8 char
105-108	Total amount of data for instrument 3 for orbit	dddd	4 char
109-112	Total number of instances of "no data avail" for instrument 3 for orbit	dddd	4 char
113-116	Name of instrument 4	aaaa	4 char
117-118	Number of variables for instrument 4	dd	2 char
119-126	Last date data entered for instrument 4-orbit	MM/DD/YY	8 char
127-130	Total amount of data for instrument 4 for orbit	dddd	4 char
131-134	Total number of instances of "no data avail" for instrument 4 for orbit	dddd	4 char
135-138	Name of instrument 5	aaaa	4 char
139-140	Number of variables for instrument 5	dd	2 char
141-148	Last date data entered for instrument 5-orbit	MM/DD/YY	8 char
149-152	Total amount of data for instrument 5 for orbit	dddd	4 char
153-156	Total number of instances of "no data avail" for instrument 5 for orbit	dddd	4 char
157-160	Name of instrument 6	aaaa	4 char
161-162	Number of variables for instrument 6	dd	2 char
163-170	Last date data entered for instrument 6-orbit	MM/DD/YY	8 char
171-174	Total amount of data for instrument 6 for orbit	dddd	4 char
175-178	Total number of instances of "no data avail" for instrument 6 for orbit	dddd	4 char
179-182	Name of instrument 7	aaaa	4 char
183-184	Number of variables for instrument 7	dd	2 char
185-192	Last date data entered for instrument 7-orbit	MM/DD/YY	8 char

193-196	Total amount of data for instrument 7 for orbit	dddd	4 char
197-200	Total number of instances of "no data avail" for instrument 7 for orbit	dddd	4 char
201-204	Name of instrument 8	aaaa	4 char
205-206	Number of variables for instrument 8	dd	2 char
207-214	Last date data entered for instrument 8-orbit	MM/DD/YY	8 char
215-218	Total amount of data for instrument 8 for orbit	dddd	4 char
219-222	Total number of instances of "no data avail" for instrument 8 for orbit	dddd	4 char
223-226	Name of instrument 9	aaaa	4 char
227-228	Number of variables for instrument 9	dd	2 char
229-236	Last date data entered for instrument 9-orbit	MM/DD/YY	8 char
237-240	Total amount of data for instrument 9 for orbit	dddd	4 char
241-244	Total number of instances of "no data avail" for instrument 9 for orbit	dddd	4 char
245-248	Name of instrument 10	aaaa	4 char
249-250	Number of variables for instrument 10	dd	2 char
251-258	Last date data entered for instrument 10-orbit	MM/DD/YY	8 char
259-262	Total amount of data for instrument 10	dddd	4 char
263-266	Total number of instances of "no data avail" for instrument 10 for orbit	dddd	4 char

FILE 3 - DATA FILE

This file consists of 20,769 376-byte logical records. The logical records are packed ten to a physical record. There are 301 logical records for each of the 69 orbits. These records contain the processed orbital data centered around periapsis sampled at approximately 12-second intervals.

Logical records 1 through 301, inclusive, contain the data for orbit 1018. Logical records 302 through 602, inclusive, contain the data for orbit 1019, etc.

The first logical record for each orbit contains the data for all of the instruments' variables sampled at the UT start time specified for the orbit in its status record (File 2). The orbit's second logical record contains the instruments' variables' data sampled 12 seconds after the UT start time. The orbit's third logical record contains the instruments' variables' data sampled

24 seconds after the UT time, etc. The one hundred and fifty-first logical record for an orbit contains the variables' data sampled at the time of periapsis, as specified in the orbit's status record. Due to the characteristics of the available unprocessed data, there may not exist a 12 second interval between the sampling times of the periapsis data in logical record 151 and the data in logical records 150 and 152 for an orbit. However, there will be 12 second intervals between the sampling times of the data in an orbit's records 152 through 301. Therefore, the sampling time of each of an orbit's records may be calculated from the UT start, UT periapsis, and UT stop times in the orbit's status record. It is also available in each record's UTMS and UTYD variables.

Two special values were reserved to indicate the two possible null data conditons. When the LFD data base was initialized, all of the variables' values were set to hexadecimal X'FFFFFFFF' indicating an un-updated null data condition. The second special null data value is a hexadecimal X'7FFFFFFF'. It is used to indicate that data will never be available for a variable for the orbit and sampling time, e.g., when an instrument was turned off during an orbit. All other values found in the data file can be interpreted as actual data.

The order of the instruments' variables' data and their formats in the records of the third file are listed below. Note that the first four bytes of a data record act as a key, giving the record's orbit and nominal time relative to periapsis. A brief description of each of the listed variables can be found in Attachment 2.

BYTES 001-004 KEY FIELD CONSISTING OF:
BYTES 001-002 BINARY ORBIT NUMBER
BYTES 003-004 BINARY 12 SECOND TIME INTERVAL -1800,-1788,...1788,1800
BYTES 005-008 AMV BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 009-012 ATTX BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 013-016 ATTY BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 017-020 ATTZ BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 021-024 BMAG BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 025-028 BXSC BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 029-032 BYSC BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 033-036 BZSC BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 037-040 COL BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 041-044 DBTL BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 045-048 DBTR BELONGING TO THE OMAG INSTR IN FLOATING PT FORMAT
BYTES 049-052 DCO BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 053-056 DCO2 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 057-060 DHE BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 061-064 DN2 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 065-068 DO BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 069-072 DXP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 073-076 DYP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 077-080 DZP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 081-084 ELNE BELONGING TO THE OETP INSTR IN FLOATING PT FORMAT
BYTES 085-088 ELTE BELONGING TO THE OETP INSTR IN FLOATING PT FORMAT
BYTES 089-092 EMAG BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT
BYTES 093-096 ETEM BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 097-100 I001 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 101-104 I002 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 105-108 I004 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 109-112 I008 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 113-116 I012 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 117-120 I014 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 121-124 I016 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 125-128 I017 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 129-132 I018 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 133-136 I024 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 137-140 I028 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 141-144 I030 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 145-148 I032 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 149-152 I040 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 153-156 I044 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 157-160 I056 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 161-164 LATP BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 165-168 LONP BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 169-172 MAGR BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 173-176 MI BELONGING TO THE OETP INSTR IN FLOATING PT FORMAT
BYTES 177-180 MONE BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 181-184 MTWO BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 185-188 MVE BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 189-192 NONE BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 193-196 NTOT BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 197-200 NTWO BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 201-204 NVR1 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 205-208 NVR2 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT

BYTES 209-212 NVR3 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 213-216 NVR4 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 217-220 NVR5 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 221-224 PBSP BELONGING TO THE OPA INSTR IN FLOATING PT FORMAT
BYTES 225-228 PFLX BELONGING TO THE OPA INSTR IN FLOATING PT FORMAT
BYTES 229-232 RLAT BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 233-236 RLON BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 237-240 RRAD BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 241-244 RRHO BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 245-248 SHA BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 249-252 SHT BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 253-256 SLOP BELONGING TO THE ORAD INSTR IN FLOATING PT FORMAT
BYTES 257-260 SPIN BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 261-264 SPOT BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 265-268 SPR1 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 269-272 SPR2 BELONGING TO THE OIMS INSTR IN FLOATING PT FORMAT
BYTES 273-276 SZA BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 277-280 TONE BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 281-284 TTWO BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 285-288 UTMS BELONGING TO THE SEDR INSTR IN FIXED DECIMLFORMAT
BYTES 289-292 UTYD BELONGING TO THE SEDR INSTR IN FIXED DECIMLFORMAT
BYTES 293-296 VES BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 297-300 VS BELONGING TO THE OETP INSTR IN FLOATING PT FORMAT
BYTES 301-304 VVR1 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 305-308 VVR2 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 309-312 VVR3 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 313-316 VVR4 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 317-320 VVR5 BELONGING TO THE ONMS INSTR IN FLOATING PT FORMAT
BYTES 321-324 WVL BELONGING TO THE OUVS INSTR IN FLOATING PT FORMAT
BYTES 325-328 XP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 329-332 XS1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 333-336 XVEL BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 337-340 YP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 341-344 YS1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 345-348 YVEL BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 349-352 ZP1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 353-356 ZS1 BELONGING TO THE SEDR INSTR IN FLOATING PT FORMAT
BYTES 357-360 ZVEL BELONGING TO THE ORPA INSTR IN FLOATING PT FORMAT
BYTES 361-364 100H BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT
BYTES 365-368 31KH BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT
BYTES 369-372 54KH BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT
BYTES 373-376 730H BELONGING TO THE OEFD INSTR IN FLOATING PT FORMAT

Definition of OETP UADs Low Frequency Data Files (LFDF)

Introduction

The Orbiter Electron Temperature Probe is an instrument that provides measurements of electron temperatures, T_e, electron density, N_e, and spacecraft potential, V_s. These parameters are derived by computer fitting of the volt-ampere curves recorded and stored for ground analysis. Inflight analysis circuitry is provided in the instrument to provide higher spatial resolution than is possible with the stored volt-ampere curves that are returned at the rate of several per minute, the actual rate depending upon the spacecraft bit rate at the time. Full details of the instrument are discussed by Krehbiel et al., IEE Transactions on Geoscience and Remote Sensing, Vol. GE-18, No. 1, Jan. 1980.

The UAD Low Frequency Data Files (ELTE, ELNE, VS)

The LFDF for OETP is based on the computer fitting of stored volt-ampere curves. Since the volt-ampere curves are not necessarily recorded at the 12 second intervals of the LFDF, each value entered in the file is a weighted average of the T_e, N_e, or V_s values derived within 12 seconds of the assigned time. When the spacecraft data rate is too low, or the instrument command mode did not favor the recovery of stored volt-ampere curves, UADs values of T_e, N_e, and V_s may not have been possible within 12 seconds of all assigned UADs times. As a result, no value was entered in some time slots.

Cautions in using the Data

The ionosphere of Venus, particularly on the nightside, often is spatially structured on a scale that is smaller than the 12 second spacing of the UADs LFDF. As a result of this structure, our 24 second averaging of the OETP measurements may provide values that are not representative of the UADs time of sample.

When the spacecraft was deep enough in the atmosphere to encounter a neutral gas density exceeding approximately 1×10^{9} cm^{-3}, the impact of the neutrals on the spacecraft appears to have generated secondary electrons which interfered with the OETP operation, particularly the axial sensor which was mounted on the forward-looking surface of the satellite. These electrons have temperatures much higher than the ionospheric T_e, with the result that the instrument adapted its voltage sweep to full amplitude which resulted in a loss of accuracy of the T_e and N_e measurement. T_e may not be available at all near periapsis on many orbits. This "periapsis effect" occurs below approximately 165 km on the dayside and 155 km on the nightside. Users of the data below this altitude should be cognizant that measurement accuracy may be reduced. We have attempted to delete data having errors likely to exceed a factor of two, but cannot guarantee complete success in this goal.

Owing to possible errors due to spacecraft shielding effects, the N_e and T_e data were deleted when $N_e < 10^{3}$/cc. When N_e exceeded approximately 6×10^{5}/cc, saturation of the axial sensor electrometer precluded the measurement of N_e. This unplanned upper limit on N_e was caused by the unexpectedly large periapsis effect which caused the full amplitude sweep voltage to be applied near periapsis. The resulting currents were larger than expected. In this

situation the total plasma density can be derived from the ion currents collected from the probe, but these values are not routinely available in the VADs files.

Sent to HKH → Controller Digital Data
8/96

LFD Variables Names

The ORAD LBL variables will have the following mnemonics and meanings:

* RLAT: The Venus crust-fixed latitude of the center of the radar footprint (expressed in degrees -90 to +90).

* RLON: The Venus crust-fixed longitude of the center of the radar footprint (expressed in degrees 0 to 360).

* RRAD: The measured planetary radius at (RLAT.RLON) expressed in km with 6051.2 subtracted (to retain significant digits).

* SLOP: The measured RMS surface slope in degrees at (RLAT.RLON). The value is a measure of the roughness of the surface at the scale of a few radar wavelengths (i.e., 1 to 10 meters).

* RRHO: The measured radar reflectivity averaged over the radar footprint (typically 10 km x 10 km). The value is related to the dielectric constant (EPS) of the surface material by the approximate formula:

RHO = (1 - SQRT(EPS)) / (1 + SQRT(EPS))

ORPA

materials to district (WSC)
78-05 A-07A
LFB

PIONEER VENUS

ORBITER RETARDING POTENTIAL ANALYZER

DATA DOCUMENTATION

William C. Knudsen

INTRODUCTION

The retarding potential analyzer measures a large number of the ionospheric plasma parameters which define the state of a plasma. The quantities placed in the UADS low frequency data file are listed in Table 1 together with the range of measurement, noise level, and uncertainty.

Descriptions of the retarding potential analyzer flown on the Pioneer-Venus mission are given by Knudsen et al. (1979, 1980). The principles of measurement are explained therein. Many of the factors effecting accuracy of the results are also described therein but some additional information is presented in the calibration section below.

DATA LIMITATIONS

Because of the low bit rate available to the ORPA, data from only one characteristic curve per spin period could be transmitted to earth. The several RPA measurement modes had to share this low sample rate. Consequently, the electron temperature was typically measured approximately every 48 seconds. The ion parameters were sampled approximately every twelve seconds with a time interval of 24 or 36 seconds separating groups of three measurements (Knudsen et. al 1979, 1980). The characteristic curves themselves required only 0.3 seconds or less to complete. Thus, the measurements approximate point measurements made infrequently.

The low frequency data file (LDF) consists of quantities at specified 12 second intervals. To satisfy this requirement with data measured less frequently, we have interpolated our measured values to the nearest LDF time. In some instances, the meaured quantity has been interpolated to the two LDF times on either side of the measurement time.

Constituent ion concentrations, ion temperatures and component velocity are derived from the ion data using the least squares technique. The accuracies given in Table 1 are applicable only when a good least squares fit was achieved. Occasionally, the fit will be erroneous for one or more constituents and the poor quality of the fit will not be recognized by the software programs which reduce the data. Erroneous results for these cases have not been removed from the file by human judgment.

When data are unavailable at an LFD time slot for any variable the number in that slot is HEX '7FFFFFF' (See User's Guide Page 4-24).

Additional limitations are discussed below under specific variables.

ETEM

The electron energy distribution always departed from a simple Maxwellian distribution to a greater or lesser extent. We defined T_e to be equal to the smallest value of

$$(1) \quad T_e = -\frac{e}{k}\frac{\Delta V}{\Delta \log(-I_e)}$$

measured in a single electron characteristic curve.

For most orbits T_e is measured every 48 seconds. For occasional orbits, it was measured at 12 second intervals.

MONE, MTWO

The ion masses are identified by their bulk kinetic energy relative to the ORPA. Only the two most abundant ion masses are given.

NONE, NTWO

The concentration of the two most abundant ions detected are placed in the LDF file. The ORPA does not usually detect a light ion constituent in the present of heavier constituents unless its concentration is greater than 10% of the heavier constituent(s). The concentration of any constituent had to be above approximately 300 cm^{-3}

to be detected as a constituent. The concentration of constituent ions is corrected for the drift velocity of the ions.

TONE, TTWO

If both ion temperatures are identical in the LDF File, both were assumed to be identical in deriving the temperature by the least-squares technique. If the two temperatures are not identical, each ion was permitted to have a distinct temperature.

XVEL, YVEL, ZVEL

The ion drift (or bulk) velocity is derived from three independent components measured in three successive roll periods (Knudsen et al. 1979). The velocity field is assumed, of necessity, to be uniform over the distance traversed by the spacecraft during the 24 seconds between first and last component. The three components are given in the non-rotating spin coordinate system and are for the O^+ ion.

SPOT

The spacecraft potential is measured in the electron mode and is the spacecraft ground potential (including work function of grid surfaces) relative to the plasma potential.

NTOT

The total ion concentration is derived from the saturation ion current assuming that (1) the ion thermal velocity is small compared with the spacecraft velocity and (2) the bulk ion velocity relative to the spacecraft is equal to the component velocity measured for the dominant ion when this is available and (3) when the component velocity is not available the bulk ion velocity relative to the spacecraft is equal to the spacecraft velocity.

CALIBRATION

The principles of measurement with the ORPA are given in considerable detail in Knudsen et al. (1979, 1980). Many of the factors affecting the accuracy of measurement are described in the same documentation. Additional information is summarized in this section.

The electrometer current sensitivity was calibrated to an absolute accuracy of one percent prior to launch and has been monitored by an in-flight calibration mode since launch. No change in calibration has been detected since launch. The sensitivity is controlled by metal oxide feedback resistors and is expected to change very slowly with age.

The retarding potential steps values were calibrated in the laboratory to an absolute accuracy of 0.1% prior to launch. The values have been checked by an inflight calibration mode periodically since then with no measurable change. The optical transmission of the individual sensor grids was measured to an absolute accuracy of 1%.

The accuracy of the geophysical parameters which are derived from the RPA I-V curves is primarily limited by (1) knowledge of the "real" or effective grid transmission which is a function the angle of attach, retarding potential and grid construction; (2) finite radius of the RPA, (3) spacecraft environment effects and (4) the particle energy distribution not being Maxwellian. We estimate the "typical" uncertainty in the geophysical parameters from all sources to be the values specified in Table 1. Individual cases may have larger errors because of poor least-squares fit to the data.

PVO NIF p. 6

REFERENCES

Knudsen, W. C., J. Bakke, K. Spenner, and V. Novak, "Retarding Potential Analyzer for the Pioneer-Venus Orbiter Mission, Space Science Inst. 4, 351-372, 1979.

Knudsen, W. C., K. Spenner, J. Bakke, and V. Novak, "Pioneer Venus Orbiter Planar Retarding Potential Analyzer Plasma Experiment" IEEE Trans. Geos. Remote Sens., GE-18, 1, 54-59, 1980.

TABLE 1

UADS VARIABLE NAME	QUANTITY	RANGE	NOISE LEVEL	UNCERTAINTY*
ETEM	Electron Temperature	300-20,000K	-	10%
MONE	Mass of Ion 1	1-44 AMU	-	-
MTWO	Mass of Ion 2	1-44 AMU	-	10%
NTOT	Total Ion Density	$10\text{-}10^7$ cm^{-3}	10 cm^{-3}	10%
NONE	Number Density for Ion 1	$300\text{-}10^7$ cm^{-3}	300 cm^{-3}	10%
NTWO	Number Density for Ion 2	$300\text{-}10^7$ cm^{-3}	300 cm^{-3}	10%
TONE	Temperature of Ion 1	150-10,000K		5%
TTWO	Temperature of Ion 2	150-10,000K		5%
XVEL	X Component of Ion Drift Velocity	0-7 km/s	0.2 km/s	0.2km/s
YVEL	Y Component of Ion Drift Velocity	0-5 km/s	0.4 km/s	0.4km/s
ZVEL	Z Component of Ion Drift Velocity	0-5 km/s	0.4 km/s	0.4km/s
SPOT	Spacecraft Potential Relative to Plasma	-5 to +3 Volt	-	0.2 Volt

*These uncertainties apply when the quantity is well above the noise level.

PVO RPP

BIBLIOGRAPHY

Bauer, S. J., Brace, L. H., Hunten, D. M., Intriligator, D. S., Knudsen, W. C., Nagy, A. F., Russell, C. T., Scarf, F. L., Wolfe, J. H., The Venus Ionosphere and Solar Wind Interaction, Space Science Reviews, 20, 413-430, June 1977.

Knudsen, W. C., Spenner, K., Whitten, R. C., Spreiter, J. R., Miller, K. L., and Novak, V., Thermal Structure and Major Ion Composition of the Venus Ionosphere: First RPA Results from Venus Orbiter, Science, 203, 757-763, Feb. 23, 1979.

Knudsen, W. C., Spenner, K., Whitten, R. C., Spreiter, J. R., Miller, K. L., Novak , V., Thermal Structure and Energy Influx to the Day and Night-side Venus Ionosphere, Science, 205, 105-107, July 6, 1979.

Knudsen, W. C., Bakke, J., Spenner, K., Novak, V., Retarding Potential Analyzer for the Pioneer Venus Orbiter Mission, Space Science Instru., 4, 351-372, 1979.

Knudsen, W. C., Bakke, J., Spenner, K., Novak, V., Pioneer Venus Orbiter Planar Retarding Potential Analyzer Plasma Experiment, IEEE Trans. Geoscience and Remote Sensing, GE-18, 1, 45-49, Jan. 1980.

Whitten, R. C., and Knudsen, W. C., Simple Models of the Thermal Structure of the Venusian Ionosphere, Accepted, Icarus, 1980.

Spenner, K., Knudsen, W. C., Miller, K. L., Novak, V., Russell, C. T., Elphic, R. C., Observations of the Venus Mantle, The Boundary Region Between Solar Wind and Ionosphere. Accepted, Jour. Geophys. Res.,1980.

Knudsen, W. C., Miller, K. L., Spenner, K., Novak, V., Michelson, P. F. Whitten, R. C., Suprathermal Electron Energy Distribution within the Dayside Venus Ionosphere. Accepted, Jour. Geophys. Res., 1980.

Miller, K. L., Knudsen, W. C., Spenner, K., Novak, V., Whitten, R. C., Solar-Zenith-Angle Dependence of Ionospheric Ion and Electron Temperatures and Density on Venus. Accepted, Jour. Geophys. Res., 1980.

Knudsen, W. C., Spenner, K., Miller, K. L., Novak, V., Transport of Ionospheric O^+ Ions Across the Venus Terminator and Implications. Accepted, Jour. Geophys. Res., 1980.

what parameters are listed
& ordered how?

materials for district.

ONMS

78-05.A 11A

LFD

I. The Orbiter Neutral Mass Spectrometer (ONMS)

The instrument was designed primarily to determine the composition of the neutral thermosphere/exosphere of Venus. The term composition includes both the kind of neutral gases present and their quantitative amount. The measurements begin at periapsis and extend to a limiting altitude at which the ambient signal becomes comparable to the noise and gas background. The neutral compositin includes helium, atomic nitrogen, atomic oxygen, molecular nitrogen carbon monoxide and carbon dioxide.

The ONMS instrument has been described in "Pioneer Venus Orbiter Neutral Gas Mass Spectrometer Experiment", IEEE transactions in Geoscience and Remote Sensing, GE-13 (1), 1980. A discussion of the acquired data, the reduction to meaningful composition and examples of the composition and temperature of the thermosphere/exosphere for the first Venus diurnal cycle is given in "Mass Spectrometric Measurements of the Neutral Gas Composition of the Thermosphere and Exosphere of Venus", JGR, December 1980. The papers are reproduced here for convenient reference. As of this date no known instrument anomalies have occurred which would indicate a malfunction of the ONMS instrument.

II. Reduction to Composition

Reference to the basic data reduction has been given Section I. The source of data and their corrections are summarized below.

Gas	m/e used	Comments
Hc	4	
N	30	Surface recombined N and O
O	32	Surface recombined O to O_2; corrected for CO_2 fragmentation at m/e 32; corrected for surface loss of O to CO_2*.
N_2,CO	28,14	m/e 14 corrected for NO,CO_2 and CO fragmentation. m/e 28 corrected for CO_2 fragmentation.
CO_2	44	corrected for surface reaction of O to CO_2*.

* A correction based on matching scale height temperatures of O and CO_2.

Data were further limited to an angle of attack of 40° to eliminate erroneous points due to spacecraft antenna shadowing.
All data used for the UADS insertion were obtained from the non-retarding potiential mode of the instrument. Data from the retarding mode of the instrument are consistant with those obtained from th non-retarding mode and have not been included.

III. Description of ONMS variables in the Unified Abstract Data System (UADS)

The following single variables are used for ONMS data storage:

NAME	DESCRIPTION	UNITS
DCO	Particle density of carbon monoxide	CM-3
DCO2	Particle density of carbon dioxide (CO_2)	CM-3
DHE	Particle density of helium (HE)	CM-3
DN2	Particle density of molecular nitrogen (N_2)	CM-3
DO	Particle density of atomic oxygen (O)	CM-3

The following paired variables are used for ONMS data storage:

Pair	Name	Description	Units
1	VVR1	Total Mass density	G/CM-3
	NVR1	Pseudo atomic mass number = 50.	
2	VVR2	Total number density	CM-3
	NVR2	Pseudo atomic mass number = 51.	
3	VVR3	Particle density of atomic nitrogen (N)	CM-3
	NVR3	Atomic mass number = 14.	
4	VVR4	Value of variable 4	TBD
	NVR4	Variable 4 code	TBD
5	VVR5	Value of variable 5	TBD
	NVR5	Variable 5 code	TBD

In general NVRX (where X = variable number 1...5) is a code which indicates what variable is being placed in the value field VVRX. Variable pairs 1, 2 and 3 have been given permanent assignments while 4 and 5 have yet to be assigned.

The following variables have been initialized in the UADS for orbits 1-37 by ARC but not used by ONMS: NA, NCO, NCO2, NHE, NH2, NN2, NO. In addition NVR4, VVR4, NVR5, and VVR5 are defined only for orbits > 37.

IV. Criteria for insertion of ONMS data into UADS

Several criteria must be met for data to be inserted into a given orbit in the UADS system. The orbit must be initialized in the UADS, the spacecraft format/bit rate must have been appropriate for acquisition of data by ONMS and the command sequence of ONMS must have been such that useful atmospheric composition can be determined.

Cases where useful composition cannot be determined include special test modes (e.g. retarding potential sweeps, filament off etc.) and normal modes where needed composition corrections cannot be applied (e.g. unit amu sweep at low bit rate or 1/8 amu sweep). In general fill or "not available" data is indicated by the standard HEX 7FFFFFFF value.

A given initialized orbit inserted by ONMS will have either valid data or fill for all 301 time tags (-1800...0...1800). The universal time of periapsis and of the +12 time tag were used to generate all of the required UAD times. Orbits 1-19 were not put into UADS because gas-surface processes in the ion source of the instrument had not stabilized and reliable composition data are not available.

Data values at the required time tags were constructed by using a 24 second weighted average of the high resolution data centered at the required time. Corrections to the number densities of CO_2 and O for surface reactions involving O were made at this time. The total mass density and total number density was summed only if all major constituents were present (i.e. CO_2, CO,N_2 and O). A minimum of 3 data points were required for the average with the specified UADS time to be contained within the data time extremes.

The actual altitude limit to which the data extends is variable depending on the gas, periapsis altitude, and the overall high altitude gas background. The high altitude data cut off for any given gas was set when the reletive error in the value of the number density resolting from counting statistics and background signals exceeded 30%. An absolute altitude cut off of 250km was used for all gases except He for which 350km was used. These limits represent the best current estimate of regions where surface outgasing or ingassing becomes predominant or where the (noise/signal) becomes appreciable.

Revised

Attachment

OMAG/OEFD

Description of Pioneer Venus Orbiter Magnetometer and Electric Field Data in PVO Unified Abstract Data System (UADS)

materials for distrib. (wsc)

12 § 13 78-051A-12A 13A

LFD

The regular processing of the Pioneer Venus orbiter magnetic and electric field experiments includes the production of 24-second averages every 12-seconds. The data from this processing surrounding periapsis are sent to the UADS file.

The magnetic field data are in spacecraft coordinates. Spacecraft coordinates have their X-axis in the spin plane pointed towards the sun, their Y-axis in the spin plane along the direction approximately antiparallel to planetary motion and their Z-axis along the spin axis northward. The timing of the UADS file is every 12-seconds from periapsis. The timing of the original data processing is "arbitrary". Thus the data in UADS is the data point whose center time is closest to the UADS time. This results in a ± 6 second uncertainty in the center time of each 24-second average. In addition to the X, Y, Z components and total field the standard deviations along the spin axis and of the total field are put in the file. The units are gammas.

The electric field data are the peak spectral amplitudes in each of the four (30% bandwidth) filter channels centered at 100 Hz, 730 Hz, 5.4 kHz, and 30 kHz. The peak amplitudes are also calculated every 24-seconds over the exact same interval as the magnetic field data. The units are $(V/m)/\sqrt{Hz}$, and the time between samples varies with the Orbiter telemetry rate, as discussed by Scarf, Taylor and Virobik in the attached reprint. Much additional information on the instrument and several examples of full orbit plots are contained in the paper by Scarf et al. entitled "Pioneer-Venus Plasma Wave Operations: The Solar Wind-Venus Interaction (published in the J.G.R. Issue on Pioneer Venus) December 1980.

The Pioneer Venus Orbiter Plasma Wave Investigation

F. L. SCARF, W. W. L. TAYLOR, AND P. F. VIROBIK

Abstract—The Pioneer Venus plasma wave instrument has a self-contained balanced electric dipole (effective length = 0.75 m) and a 4-channel spectrum analyzer (30-percent bandwidth filters with center frequencies at 100 Hz, 730 Hz, 5.4 kHz, and 30 kHz). The channels are continuously active and the highest Orbiter telemetry rate (2048 bps) yields 4 spectral scans/s. The total mass of 0.55 kg includes the electronics, the antenna, and the antenna deployment mechanism. This report contains a brief description of the instrument design and a discussion of the in-flight performance.

INTRODUCTION

SINCE DECEMBER 5, 1978, the electric field detector on the Pioneer Venus Orbiter has been providing measurements of wave activity in the plasma environment of Venus. The Orbiter plasma wave instrument uses a short self-contained electric dipole to detect the signals which are processed in 4 continuously active bandpass channels covering the frequency range from 100 Hz to 30 kHz. The instrument is gathering data on many aspects of the mode of interaction between the solar wind and the ionosphere (e.g., on processes that develop in the upstream solar wind region, near the bow shock and ionopause and within the ionosphere, ionosheath, and wake cavity). The instrument was also designed to collect data on whistler mode electromagnetic noise bursts from the atmosphere, and it appears that lightning from Venus is being detected by the Orbiter wave instrument.

BACKGROUND

The original proposal for a plasma wave instrument on the Pioneer Venus Orbiter was based on the design of the electric field detectors operating on Pioneer 8, 9 [1]. In fact, it was first proposed that an existing Pioneer 9 flight spare unit be flown, using a spacecraft element (boom or antenna) as an unbalanced electric field dipole. With this plan, the requirements on the spacecraft would have been minimal (the Pioneer 9 spare has four analog telemetry outputs, no internal commands, a mass of 0.36 kg, and total power consumption of 420 mW; the proposed antenna concept would have required some mass addition for the antenna diplexer and cabling, but no deployment mechanisms or deployment commands were required). This proposal was accepted in principle, but it turned out to be impossible to use the Pioneer 9 spare or to use a spacecraft element as an antenna. At this point it became necessary to design a new Pioneer Venus plasma wave instrument with the following constraints: a) total mass near 0.5 kg, including antenna and deployment mechanism. b) power consumption near 0.5 W; c) no commands for antenna deployment; and d) 4 analog telemetry outputs. Another significant constraint on the antenna design involved the need to provide sufficient rigidity so that the antenna would not strike the spacecraft or the solar arrays during powered flight (such as the Centaur burns near earth and the burn of the Orbit Insertion Motor at Venus).

Manuscript received September 1, 1979. This project was supported by the Pioneer Project at NASA Ames Research Center under Contracts NAS2-8809 and NAS2-9842.

The authors are with TRW Defense and Space Systems, Redondo, CA 90278.

INSTRUMENT DESCRIPTION

The constraints discussed above presented a number of serious mechanical and electronic problems and it was clear that the instrument would have to have a limited number of bandpass channels and a relatively small antenna. The science requirements of the Venus mission provided additional constraints, such as the need to cover a frequency range from below the anticipated electron cyclotron frequency up to the nominal interplanetary electron plasma frequency. The high speed of the spacecraft through the shock, ionopause, and ionosphere required the use of continuously active channels to measure rapid temporal variations without error. Finally, in order to use a body-mounted sensor on a spinning spacecraft with irregular solar arrays, it was evident that a balanced electric dipole would be needed to achieve common mode rejection of interference signals.

The resulting design is shown in Fig. 1, which contains a block diagram of the electronics circuit and a drawing of the mounting of the deployed antenna on the Orbiter spacecraft. The electronics is packaged in a two-level box, as shown in Fig. 2. The dimensions of the upper part are 12.2 cm X 6.6 cm X 5.5 cm, and those of the base are 19 cm X 6.6 cm X 2 cm, with a total unit mass of 0.5 kg. The key to the overall instrument design was fundamentally related to the plan for mounting and deploying the antenna. As shown in Figs. 3 and 4, the entire 50-g antenna unit was mounted directly on the electronics box, and the individual spring-loaded antenna elements were stowed against the inside surface of the launch vehicle fairing, so that they deployed automatically as the fairing was ejected. In the deployed position the center of each wire grid is 0.69 m from the point of connection to the electronics unit, and the sphere-to-sphere separation is 0.76 m. The wire grids are placed at the ends in order to provide a lumped capacitance with small collecting area. The individual wire circles have diameters of 10.5 cm, and the antenna effective length is 0.75 m. Since this antenna system with small

0196-2892/80/0100-0036$00.75

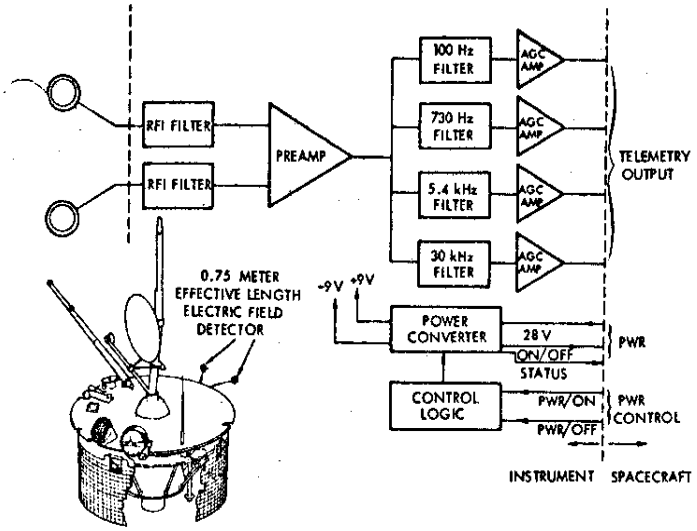

Fig. 1. Block diagram and drawing of the Pioneer Venus Orbiter showing the orientation of the antenna elements after deployment.

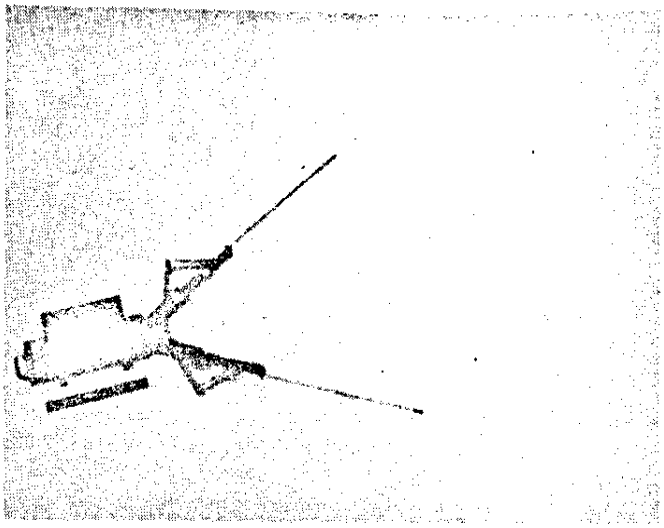

Fig. 3. The complete Pioneer Venus plasma wave instrument with the antenna unit mounted on the electronics box.

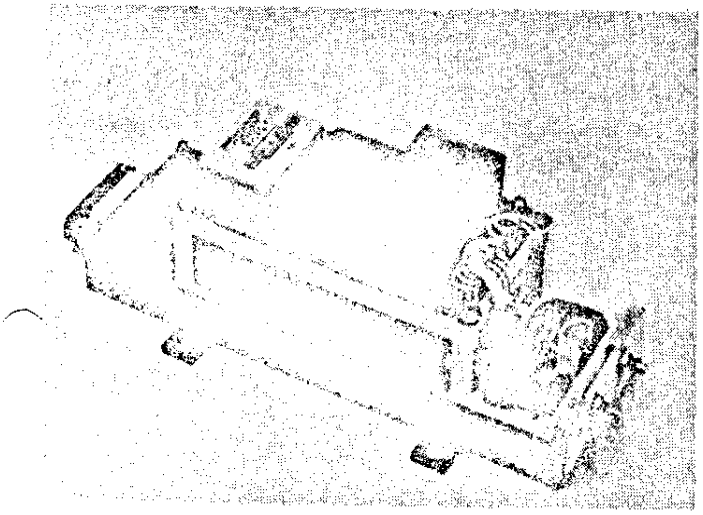

Fig. 2. The electronics unit of the plasma wave instrument (electric field detector).

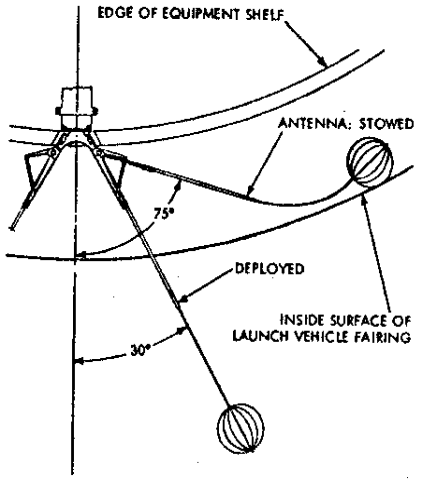

Fig. 4. Drawings of the antenna in the stowed and the deployed positions.

collecting area responds to induced electric fields, the transfer function for the antenna/input circuit is determined by placing the entire unit in a large parallel-plate capacitor. The capacitor is driven with a calibrated signal generator, and the preamplifier output is measured as the frequency is varied.

The differential preamplifier input uses a pair of 2N5556 field effect transistors specifically selected to provide matched gains and low noise levels. The input circuit was designed to have low input capacitance in order to minimize possible effects of varying antenna capacitance associated with changing plasma sheath conditions.

Some additional characteristics of the 4-channel spectrum analyzer are worth noting. The four filters have frequency response curves similar to those used in the 400-Hz, 22-kHz, and 30-kHz channels on Pioneer 8, 9 [1], but for the Pioneer Venus Orbiter we selected filters with 30-percent fractional bandwidth rather than the 15-percent units used previously. The automatic gain control amplifiers used here have rise times on the order of 50 ms, with decay times of approximately 500 ms.

Finally, the telemetry interface with the Orbiter spacecraft is straightforward. The 4 analog outputs are converted to digital form by the spacecraft and transmitted to earth in a way that depends on the selected format and on the telemetry rate. One minor frame has 512 bits, and the spacecraft transmission rates range from 4 minor frames/s down to 1 minor frame/64 s. Near periapsis the customary rates have been 2 to 4 minor frames/s during the first year in orbit.

In two of the spacecraft telemetry formats (Periapsis *D*—the "Optical" format, and Periapsis *B*—an "Aeronomy" format) no plasma wave measurements are made. In format *E* ("Radar Mapping" format) only the 100-Hz channel is sampled. For the other 6 telemetry formats an entire 4-channel spectral scan is obtained with every minor frame readout. This has generally provided 2–4 scans/s near periapsis.

In-Flight Performance

The wave instrument has been acquiring data almost continuously since launch on May 20, 1978, and we find that the in-flight operation is remarkably free of interference associated with pickup of noise from spacecraft or experiment subsystems. The only known instrumental effect involves the detection of regular low level amplitude ripples when the spacecraft

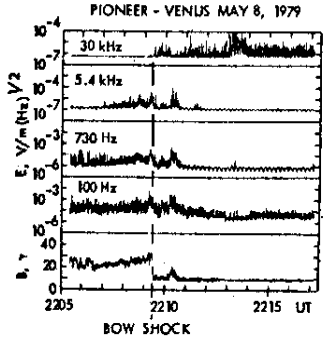

Fig. 5. Wave amplitude variations and magnetic field profile near a bow shock crossing. At this time the Orbiter was outbound (5245 km above the surface) and in sunlight (solar zenith angle of 69°).

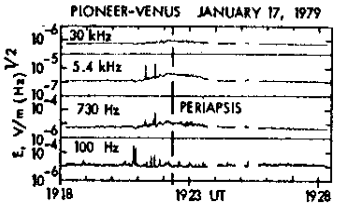

Fig. 6. Wave amplitude variations near periapsis (169 km above the surface) in darkness (solar zenith angle of 132°).

is in sunlight. This is illustrated in Fig. 5, which shows wave measurements from the region of an outbound bow shock crossing (top four panels), along with a profile of the *B*-field magnitude (bottom panel; data supplied by C. T. Russell). The amplitude modulation is evident only when the natural plasma wave activity is low, and this effect is a measure of the sun-oriented anisotropy of the plasma sheath surrounding the spacecraft, which is not an equipotential. The observed ripple arises because the antenna on the spinning spacecraft is at a different angular position with respect to the sun during each successive sampling.

Fig. 5 shows that near the shock the plasma wave instrument readily detects mid-frequency waves that we identify as ion acoustic waves (730 Hz and 5.4 kHz), and high-frequency upstream waves (30 kHz) that are thought to be electron plasma oscillations associated with suprathermal electrons. The 100-Hz activity shown here probably represents electromagnetic whistler mode turbulence.

Even in sunlight, the minimum detectable field strengths are close to the intrinsic threshold levels for the various channels. We find electric field spectral densities in units of (volts/meters)^2/(hertz) to be about 1.2×10^{-10} at 100 Hz; 1.3×10^{-11} at 730 Hz, 8.8×10^{-13} at 5.4 kHz, and 3×10^{-13} at 30 kHz. In terms of equivalent sine waves, these in-flight thresholds are approximately 30 to 60 μV/m. The instrument is capable of detecting signals up to 90 dB above these minimum levels before reaching saturation, but no very strong signals of this nature have ever been detected.

When the spacecraft is in darkness the ripple is absent, but as expected, the achievable sensitivity is not really improved. Fig. 6 shows some high resolution measurements taken near periapsis on the night side. The isolated impulsive signals may well be associated with detection of lightning. It is also possible that the more continuous enhancements in the high-frequency-wave channels represent detection of ion acoustic waves associated with currents flowing near the bottom of the ionosphere. Many other examples of Orbiter plasma wave measurements are contained in a number of additional reports [2], and these papers should be consulted for more comprehensive discussions of the wave observations.

Acknowledgment

We thank J. Atkinson and E. Vrem for their invaluable assistance with the design, fabrication, testing, and integration of the Orbiter Electric Field Detector. We are grateful to C. Hall and the staff of the Pioneer Venus Project at NASA Ames Research Center and Hughes Aircraft Company for their excellent support, and we especially acknowledge the continuing assistance of E. Tischler and W. Hightower.

References

[1] F. L. Scarf, G. M. Crook, I. M. Green, and P. F. Virobik, "Initial results of the Pioneer 8 VLF electric field experiment," *J. Geophys. Res.*, vol. 73, p. 6665, 1968; F. L. Scarf, I. M. Green, and G. M. Crook, "The Pioneer 9 electric field experiment: Part I," *Cosmic Electrodynamics*, vol. 1, p. 496, 1971.

[2] F. L. Scarf, W. W. L. Taylor, and I. M. Green, "Plasma waves near Venus: Initial observations," *Science*, vol. 203, p. 748, 1979; W. W. L. Taylor, F. L. Scarf, C. T. Russell, and L. H. Brace, "Evidence for lightning on Venus," *Nature*, vol. 279, p. 614, 1979; W. W. L. Taylor, F. L. Scarf, C. T. Russell, and L. H. Brace, "Absorption of whistler mode waves in the ionosphere of Venus," *Science*, vol. 205, p. 112, 1979.

OUVS

materials for distribut (WSC)

78-051A-15B

LFD

NSSDC Documentation

Pioneer Venus
ORBITER ULTRAVIOLET SPECTROMETER

CONTENTS:

1. Excerpt from Pioneer Venus Experiment Descriptions, Pioneer Project Office Document #PD-401.
2. Reprint of "Instrument paper" published in IEEE.
3. Brief description of submitted data.
4. Brief description of data reduction procedures.
5. Bibliography
6. Catalog of submitted data.

MP-051A-15B

6. AIRGLOW PROGRAMMABLE ULTRAVIOLET SPECTROMETER EXPERIMENT

A. I. Stewart
C. A. Barth
C. W. Hord
G. E. Thomas
D. E. Anderson

University of Colorado

OBJECTIVES

To investigate the composition of the thermosphere as a function of position and time; to measure the temperature and investigate the energy balance of the thermosphere, as functions of position and time; to measure the distribution and escape rate of atomic hydrogen in the thermosphere and exosphere, as functions of time; to measure the ultraviolet scattering properties of the cloud tops, hazes, and adjacent atmosphere, and to investigate the spectral nature, distribution, and movement of the UV albedo features.

CONCEPT AND APPROACH

The absorption, degradation, and subsequent downward conduction of solar extreme UV energy by a planet's outer atmosphere gives rise to the so-called thermosphere, characterized by a positive temperature gradient and bounded above by the collisionless exosphere. In the course of its degradation, this energy produces many optical emissions, which are collectively known as the airglow. In general, a given airglow emission may be excited by more than one mechanism, and these mechanisms may involve the emitting gas directly (as in resonance scattering of sunlight, or in excitation by photoelectron impact) or they may involve a "parent" gas (as in the photodissociation of a molecule into excited fragments, or in the photoionization of a gas into excited ion states). Some of this energy may be maintained in a latent form, such as the energy of ionization or of dissociation, and released at a different time and place. If this release occurs on the night side, a "night airglow" is produced; the night airglow can also be produced more directly by the precipitation of charged particles into the thermosphere. The spectral character of molecular band emissions, or of sets of related atomic emmisions, carries the signature of each mechanism which contributes to the excitation of the emission; and the intensity of the directly-excited emissions are simply related to the abundances of the emitting gases. Thus, the spectrum of the airglow contains information on both the composition of the thermosphere and on the mechanisms which excite its gases.

An especially interesting case is the Lyman alpha emission of atomic hydrogen. Measurements of the Lyman alpha "corona" around the planet yield the distribution and escape rate of atomic hydrogen. This escape

of hydrogen is the last step in the process by which the planet loses water, and is of importance to the evolution of its atmosphere.

In addition, the airglow contains information on the deposition and degradation of the solar energy itself. For example, the intensity of the emission from an excited ion produced by photoionization is a measure of the intensity of the solar ionizing radiation and hence of the input of energy to the thermosphere. Again, the intensity of the emissions from the excited products of dissociative recombination of ions yields information on the ion chemistry, and hence on how much of the energy of ionization appears as heat in the thermosphere. The emissions themselves may also be a significant energy loss process. The airglow thus provides information on the thermospheric energy balance; and since thermospheric temperatures can be obtained from limb profiles of airglow emissions, a coherent picture of the energetics of the region can be obtained.

Lower in the atmosphere, sunlight in the near UV penetrates to and is backscattered by the cloud-tops, but it also undergoes significant scattering by the hazes and by the molecular atmosphere above the clouds. The spectrum of the returned light therefore bears the signature of these three scattering agents--clouds, hazes, and clear atmosphere. From the spectrum, the scattering properties of the clouds and hazes, and the pressure at which they occur, can be extracted. If the dark markings in the near UV are due to an absorber, the spectrum will contain this absorption and help in its identification.

The Programmable Ultraviolet Spectrometer will measure the spectrum of Venus in two channels, from 1100A to 1900A and from 1900A to 3400A. The optics consist of a 125 mm Ebert-Fastie monochromator and a 125 mm Cassegrain telescope. Dispersion is achieved by a 3600 line/mm ruled grating, which can be rotated through 23° in 512 equal steps. The monochromator entrance slit defines a 1.8° x 0.16° field of view and its two exit slits allow light at 15A resolution to fall on the cathodes of two miniature photomultiplier tubes. Output pulses from these detectors are amplified, shaped and counted; the resulting data word is compressed and delivered to an internal data buffer, from which words are delivered to the spacecraft telemetry system on demand. The instrument is a development from earlier University of Colorado instruments carried on OGO, Mariner, and Atmosphere Explorer missions.

The Pioneer Venus instrument is designed to perform both spectrometry and fixed-wavelength scans of the planet from a spinning spacecraft. Its grating can be commanded to scan or to stand at any desired position. Spectra of the planet will be obtained under conditions when the observing geometry remains relatively constant over time required to fill the data buffer (1/2 sec). Limb and disc scans at fixed wavelength can be obtained at any time when the planet is in view. Adaption to the mission's modest data rate is achieved by the instrument's ability to collect data over a small portion of a spin, and then deliver the stored data to the telemetry stream at a much lower rate. The data acquisition process is flexible, and controlled either by ground command or by a series of

commands from the spacecraft command memory. The commandable functions include: grating mode (scan or fixed); the timing of the data segment with respect to the planet; count integration period (4, 8, 16, or 32 msec); detector selection; and special modes, such as a very low-rate mode for measuring the Lyman alpha corona during apoapsis passages.

MEASURED PARAMETERS

The day and night airglow spectrum of Venus between 1100A and 3400A.

Limb profiles of selected airglow emissions, including OI 1304A, 1356A, and 2972A; CI 1657A; HI 1216A; CO Fourth Positive and Cameron bands; CO_2^+ Doublet bands.

The intensity and distribution of the hydrogen Lyman alpha corona.

The spectrum of sunlight backscattered from the cloud-top region, between 1900A and 3400A.

Disc scans of this scattered light at selected wavelengths.

ACCURACY AND LIMITATIONS

The instrument calibration is expected to be accurate to about 30%. Sensitivity is a function of wavelength; compared to the Mariner 9 instrument, the Pioneer Venus instrument at Venus will be 15 times more sensitive to atomic oxygen at 1304A, and 3 times more sensitive to scatterers at 3000A or to CO_2^+ at 2890A. The maximum spatial resolution which can be achieved at the cloud-tops is limited by the spacecraft rotation to about 3 x .5 km; successive scans across the disc will not overlap.

LFD message in BULLETIN

OUVS entries are now present in the UADS/LFD.

The entries are more comprehensive than envisaged at the time of compilation of the USER'S GUIDE. Entries have been made describing not only airglow limb profiles, but also day airglow spectra and disc scans and night airglow disc scans. Also, the analysis of many airglow limb profiles has been simplified in the interests of reducing the computation time required and therefore increasing the availability of LFD entries.

Since many different data types are included in the new-style entries, a new variable naming scheme is necessary. Rather than introduce literally dozens of new names, we use six - UVC, UV1, UV2, UV3, UV4, UV5 - superceding the old WVL, AMX, COL, MVE, SHT, and VES. UVC is a code variable giving the key to the nature of the other quantities, UV1 through UV5.

UVC is of the form TCXXXX where:

T is the observation type code:
- T=1 indicates spectral data
- 2 indicates disc-scan data
- 3 indicates limb profile data (simplified analysis)
- 6 indicates limb profile data (full analysis)

C is the channel code:
- C=1 indicates G-channel data (wavelengths from 1100 to 1800 A)
- 2 indicates F-channel data (wavelengths from 1900 to 3400 A)

XXXX is the wavelength in Angstroms (XXXX=0000 for spectral data)

Currently there are 5 data types represented in the UADS/LFD. Following is a key to the contents of each of UV1 through UV5 for each of these 5 types.

UVC=110000: (Observation type: Day airglow spectra)
- UV1: Intensity at 1216 A (HI Lyman alpha) (in kiloRayleighs)
- UV2: Intensity at 1304 A (OI resonance line) (in kiloRayleighs)
- UV3: Intensity in the CO Fourth Positive bands, excluding the CI emissions at 1561 A and 1657 A (in kiloRayleighs)
- UV4: Emission angle (degrees)
- UV5: Solar zenith angle (degrees)

UVC=21XXXX: (Observation type: dayside G-channel disc scans)
- UV1: Slant intensity at leading limb (in kR)
- UV2: Slant intensity at mid-point of scan (in kR)
- UV3: Slant intensity at trailing limb (in kR)
- UV4: Emission angle at mid-point of scan (degrees)
- UV5: Solar zenith angle at mid-point of scan (degrees)

UVC=22XXXX: (Observation type: night-side F-channel disc scans)
- UV1: Average intensity near leading limb, corrected to zenith (in kR)
- UV2: Average intensity over interior of scan, corrected to zenith (in kR)
- UV3: Average intensity near trailing limb, corrected to zenith (in kR)
- UV4: Latitude at mid-point of scan (degrees)
- UV5: Local solar time at mid-point of scan (hours)

UVC=3CXXXX: (Observation type: day airglow limb profiles)
UV1: Maximum slant intensity at leading limb (in kR)
UV2: Zero
UV3: Maximum slant intensity at trailing limb (in kR)
UV4: Latitude at limb (degrees)
UV5: Local solar time at limb (hours)
(Note: only one limb is scanned in these observations, therefore only one of UV1 and UV3 will be non-zero.)

UVC=6CXXXX: (Observation type: day airglow limb scans)
UV1: Intensity at limb, corrected to zenith (in kR)
UV2: Topside scale height of airglow layer (in km)
UV3: Maximum volume emission rate (in cm^{-3} sec^{-1})
UV4: Latitude at limb (degrees)
UV5: Local solar time at limb (hours)

Emission and solar zenith angles, latitudes, and local solar times are calculated for the point at which the instrument line-of-sight intersects or grazes the surface R = 6189 km. In the case of G-channel spectral data (UVC= 110000), the angles are calculated for the mid-point of the data acquisition; during the acquisition the spacecraft spins through 10 degrees.

The quantities are reported in the LFD time-slot closest to their acquisition time. Because of frequent changes in observation type and because of the wide range of spatial scales for variations in the observing quantities, no interpolation between measurements is performed. Entries begin at P-10 min. and end of P+10 min.

For futher information call Ian Stewart at (303) 492-8689, or (FTS)320-5203, or 3398.

78-057A-15B

reduction p.1

Data reduction description

UVC=110000 (Observation type: day airglow spectra)

The instrument acquires a spectrum between 1170 A and 2240 A in 256 4-A steps; the acquisition takes one second, during which the S/C spins through 30^0 (15^0 on either side of the mid-point of the scan of the line of sight across the disc). The intensities are obtained by dividing the data counts by the sensitivity as a function of wavelength, and then summing the result over suitable wavelength ranges. For the intensity at 1216 A, this range is 1203 A - 1228 A (the instrument spectral resolution is 13 A fwhm). For 1304 A, it is 1291 A - 1316 A. For the CO Fourth Positive bands, it is 1413 A - 1635 A excluding the range 1544 A - 1573 A; we exclude the signal from the CI lines at 1561 A and 1657 A. The intensities are not interpreted in terms of number densities, mixing ratios, or the like. As an aid to comparing the reported slant intensities with theoretical models, the emission and solar zenith angles are computed for the intersection between the instrument line-of-sight and the spherical surface R = 6189 km (altitude = 138 km).

UVC=21XXXX (Observation type: dayside disc scans)

The spinning spacecraft causes the instrument line-of-sight to scan repeatedly across the disc of the planet. With the instrument set to a fixed wavelength, we obtain a disc scan of the emitted intensity at the chosen wavelength. The data is decalibrated and smoothed over 5^0 of spacecraft spin, and the smoothed value is reported for the leading limb, the mid-point of the scan across the disc, and the trailing limb; the limb is defined as being 6189 km from the planet's center (138 km altitude). The emission angle and solar zenith angle are reported for convenience at the mid-point of the scan.

On the dayside, observations were made at many wavelengths, including HI Lyman-alpha, the OI resonance triplet near 1304 A the OI emission at 1356 A, the CI emissions at 1561 A and 1657 A, and various members of the CO Fourth Position band system. On the nightside, only HI Lyman-alpha shows a detectable signal.

UVC=22XXXX (Observation type: night airglow disc scan)

Scans across the dark disc at wavelengths characteristic of the NO Gamma and Delta bands are analysed by first decalibrating and correcting for the observing geometry by multiplying by the cosine of the emission angle, and then averaging the resulting zenith intensity in three bins: the first 12.5% of the disc scan, the interior 75%, and the last 12.5%. Measurements within 9^0 of the terminator were excluded because of the possiblity of contamination by sunlight scattered from the bright crescent. For convenience in mapping the data, the latitude and local solar time at the mid-point of the scan are reported.

UVC=3CXXXX (Observation type: airglow limb profiles) (Simplified analysis)

Within a few minutes of periapsis, the altitude resolution at the limb is adequate to resolve airglow limb profiles. The data is decalibrated and the maximum limb intensity is found by fitting a parabola to the data points near the limb (defined at being 6189 km from the planet's center). The latitude and local solar time at the limb are also reported.

UVC=6CXXXX (Observation type: airglow limb profiles) (Full analysis)

A more complete analysis is performed on selected limb profiles. A parameterized synthetic limb intensity profile is obtained by integrating an empirical model of the volume emission rate:

$$V = \begin{cases} (VM/4) \cdot X \cdot (X-3)^2 & X \leq 3 \\ 0 & X > 3 \end{cases}$$

where

$$X = e^{-(Z-ZM)/H}$$

Here VM is the maximum volume emission rate, ZM is the altitude of this maximum, and H is the topside scale height of the emitting layer. The integrated intensity is

$$I = (VM/4) \cdot (2\pi RH)^{\frac{1}{2}} \cdot X \cdot (X^2/\sqrt{3} - 6X/\sqrt{2} + 9).$$

This model is compared to the data and best values (in a least squares sense) of VM and H are obtained. In addition to VM and H, the zenith intensity

$$I_{VERT} = \int_0^\infty V \cdot dz = (9/4) \cdot VM \cdot H$$

is reported, along with the latitude and solar time at the limb.

78-051A-15B

Useful Publications:

Space Science Reviews, 20, Nos. 3 & 4, May and June, 1977.

See especially;

L. Colin and D.M. Hunten, "Pioneer Venus Experiment Descriptions", Space Sci. Rev., 20, 451-525, 1977.

A.I.F. Stewart, "Design and Operation of the Pioneer Venus Ultraviolet Spectrometer", IEEE Transactions on Geoscience and Remote Sensing, GE-18, 65-70, 1980.

Published Results:

A.I.F. Stewart, D.E. Anderson, Jr., L.W. Esposito, and C.A. Barth, "Ultraviolet spectroscopy of Venus: initial results from the Pioneer Venus Orbiter", Science, 203, 777-779, 1979.

A.I. Stewart and C.A. Barth, "Ultraviolet night airglow of Venus", Science, 205, 57-62, 1979.

L.W. Esposito, J.R. Winick, and A.I. Stewart, "Sulfur dioxide in the Venus atmosphere: Distribution and implications", Geophys. Res. Lett., 6, 601-604, 1979.

S.T. Durrance, C.A. Barth, and A.I.F. Stewart, "Pioneer Venus observations of the Venus dayglow spectrum 1250-1430 A", Geophys. Res. Lett., 7, 222-224, 1980.

J.R. Winick and A.I.F. Stewart, "Photochemistry of SO_2 in Venus' upper cloud layers", J. Geophys. Res., 85, 7849-7860, 1980.

A.I.F. Stewart, J.-C. Gérard, D.W. Rusch, and S.W. Bougher, "Morphology of the Venus ultraviolet night airglow", J. Geophys. Res., 85, 7861-7870,

L.W. Esposito, "Ultraviolet contrasts and the absorbers near the Venus cloud tops", J. Geophys. Res., 85, 8151-8157,

78-051A-15B

PV OUVS UADS/LFD Catalog

Orbit	11	21	22	3C	6C	Orbit	11	21	22	3C	6C	Orbit	11	21	22	3C	6C
33	x					140		x				191	x			x	
38		x				142		x				193	x				
39			x			143	x					194	x	x		x	
46		x				145	x					195				x	
55			x			149	x	x		x		197				x	
57		x	x			150		x				198		x			
66			x			151	x			x		199	x			x	
68			x			156		x		x		201	x			x	
74			x			158		x				202	x	x			
79			x			159	x			x		203				x	
81			x			162	x	x				205				x	
86		x				164		x		x		207	x			x	
94			x			167	x			x		208				x	
95		x				168				x		209	x				x
102			x			170	x	x		x		210	x	x			x
103		x				174		x				222		x			
104			x			175	x			x		223	x				x
107	x					176				x		224					x
109			x			177	x					226		x			x
110			x			178	x	x		x		227					x
111		x				180		x		x		229					x
114			x			182		x				230		x			
116			x			183	x			x		234		x		x	
118			x			184				x		235					x
119		x				185	x			x		237					x
121			x			186	x	x		x		238		x			
124			x			187				x		239		x		x	
127		x				188		x		x		240					x
132		x				189				x		242		x		x	
						190		x				243					x

Data types:
- 11 Day airglow spectra
- 21 Day airglow disc scans
- 22 Night airglow disc scans
- 3C Day airglow limb profiles (Simplified analysis)
- 6C Day airglow limb profiles (Full analysis)

78-051A-15B

UNIVERSITY OF COLORADO AT BOULDER

BOULDER, COLORADO 80309

LASORATORY FOR ATMOSPHERIC AND SPACE PHYSICS (LASP)
Telephone 303-492-7677
TWX 910-940-3441
Campus Box 392

22 January 1981

Jim Smith
Bendix Field Engineering
PO Box 67
Moffett Field CA 94035

Dear Jim:

Per our phone conversation, here is a list of the changes to be made to the OUVS entries in the UADS/LFD dictionary. Note that we are only changing the names, descriptions and units for each of the OUVS entries in the dictionary. No modifications are to be made to OUVS data entries in the UADS/LFD system.

Old Name	New Name	New Description	New Units	Data Type
AMV	UV1	OUVS data word 1	---	Float
COL	UV2	OUVS data word 2	---	Float
MVE	UV3	OUVS data word 3	---	Float
SHT	UV4	OUVS data word 4	---	Float
VES	UV5	OUVS data word 5	---	Float
WVL	UVC	OUVS code word	---	Float

If there are any questions or problems, feel free to call me at (303) 492-6904 or FTS 320-3398.

Sincerely,

Randy Davis
OUVS Experiment

cc: Ian Stewart
Gil Schraeder

OIMS
materials for distrib (WSC)
78-051A-17A
LFD

Documentation for OIMS Data for UADS/NSSDC

1. The objectives and technical description of the OIMS instrument on the Pioneer Venus Orbiter are described in the IEEE Transactions on Geoscience and Remote Sensing, 1980, which is reproduced here for convenient reference.

2. The specifications for the data presently contained in the UADS data system is attached. Individual ion density values inserted into the UADS files result from an orbit by orbit review of the raw data, and generally do not provide information in regions where the results are thought to be of uncertain validity. Exceptions to this quality control review are discussed in Section 5.

3. The overall content of the data in this submission is comprised of all of the usable OIMS orbits for the first Venus year, defined as the first 240 orbits of the PVO about the planet. The listing of the specific orbits included in this period is attached. Within this series of orbits, all valid results within the altitude range of 160 to 300 kilometers are included, for all ions verified as of this date. The altitude range limits are discussed further in Section 5. In the case of ion species as yet unreported, analysis is continuing on selected subsets of data to determine the validity of occasional trace amounts of minor ions which may subsequently be inserted into the data set.

4. Calibration of the electronics system is accomplished by inserting known current values into the sensor during portions of each orbit generally unaffected by ambient ionization. The sensor/electronics response to this calibration has been monitored, and stable operation has been observed. On this basis, the observed ion currents are believed to be accurate to within approximately $\pm 5\%$, in terms of the stability of the electronics and amplifier systems.

5. There are at present two specific areas for which further analysis of the raw data will be required prior to insertion of validated data into UADS/NSSDC. The first area occurs below about 160 kilometers. In this region, the effects of variable spacecraft charging, and possible effects of spacecraft/plasma and spacecraft/neutral atmosphere interaction are being analyzed for any influence upon the evidence of rapidly varying ion composition and on the evidence for a peak in the ion density. Current understanding and comparisons with the other plasma experiments indicate that the OIMS data are likely to be largely correct in this region, and it is anticipated that at the successful conclusion of the current study, a period of reprocessing will begin in which the ion densities below 160 kilometers will be included in the data set.

The second region of uncertainity in the final processing of the ion data is that above about 300 kilometers. Throughout most of the dayside, and over many areas of the nightside, the ion distributions above about 300 kilometers indicate the presence of significant amounts of energetic ions, which require that a custom analysis of the thermal and superthermal components be performed on an orbit by orbit basis. There exist at present no available data slots within the UAD/OIMS format for the insertion of information on other than the prescribed 16 species of thermal ions, and in the event that the composition and concentrations of the energetic constituents can be determined, other arrangements will be required to include such results. The analysis of selected examples of the energetic ion distributions is currently underway. It is anticipated that within the next six months, sufficient understanding of the instrument response to these constituents may be available that a technique for producing such results on a more routine basis may be possible. At present, the upper altitude limit of 300 kilometers has been used in an automate production program which does not depend on an orbit by orbit determination of the exact altitude at which the energetic ion onset and associated uncertainties occur. Accordingly, the upper limit has been used as a rather conservative figure, although for some orbits, there are some included regions below this height in which the thermal ion concentrations recorded in UADS are believed invalid. These require identification on the basis of anomalous scale height characteristics, which are generally evident to the user. In such regions, the ion concentrations and relative ion composition must be validated by detailed analysis.

6. Several important events occur during the first Venus year, which affect the OIMS data. First, the first few orbits of the PVO had periapsis altitudes sufficiently high that the data below 300 kilometers is limited. Second, instrument commanding experiements were performed during early orbits, again limiting the useful data. As a result, orbits prior to Orbit 7 are of limited usefulness. Third, during orbits 35-40, a period of instrument commanding eliminates useful data. Otherwise, orbits not included within the first 240 result from the effects of poor data quality on tape, wrong instrument format, or other as yet unexplained problems in data processing.

7. There are several apparent instrument anomalies under further investigation which affect the recordings of individual ion species. In the case of mass 17, apparent amplifier crosstalk obscures the currents which may be present at this mass position, and for the present no ion concentrations are validated for this mass. This crosstalk effect is being analyzed further, and it is possible that some information on mass 17 may be available at a later time.

In the case of mass 44, apparent amplifier crosstalk also affects the ion distribution at higher altitudes. Above the exobase, the profiles currently in UADS require an adjustment in the direction of lowering the tabulated concentrations. A program for automatic corrections is in process.

Another apparent anomaly, in this case involving mass 4, is manifested in an unexplained distortion of the lower portion of the ion distribution. The shape of the profile at altitudes below about 200 km is sometimes anomalous, and an arbitrary lower altitude limit has been invoked to restrict the concentrations for this ion to the upper portion of the profile. This effect is not yet understood, and is under further study.

8. As described in the attached IEEE paper, the OIMS operates under automatic servo control of the sensed effects of ion velocity, spacecraft velocity, and spacecraft charge. These accommodations are monitored in the instrument housekeeping data, however, both the limitation of the data sampling of the housekeeping results as well as the complexity of the analysis of the interactive processes involved prevents extensive examination of each orbit for verification. Direct comparisons of individual orbits with other plasma instruments on the PVO, however, indicates generally good agreement in terms of total ion density. Exceptions, as noted above, occur in regions of energetic ions, and at very low altitudes. Due to the significant variability of the effects of solar wind coupling with the ionosphere, detailed orbit by orbit analysis of irregularities will be required for particular studies.

78-051A-17A

Specifications for OIMS Data in UADS

The OIMS instrument is assigned 18 variables in the UADS data base. The first 16 are used to give the average ion density determined over each twelve second interval for each of the 16 ions measured. The variable names are four characters each with first two characters being 'OI'. The other two characters are the ion mass numbers: 01, 02, 04, 08, 12, 14, 16, 18, 24, 28, 30, 32, 40, 44, and 56. Two additional variables are spares not presently used, and named SPR1 and SPR2. All of the variables are floating point numbers and the units for the ion density are ions/cubic centimeter.

The time intervals used for averaging the ion densities are determined as follows. The UT in the UADS data corresponding to the -1800 index is used as the center of a twelve second interval for averaging. Each other interval is a multiple of twelve seconds from this first point. Since the time of periapsis does not necessarily fall in the center of the 0 index interval, this means that the twelve second intervals are not exact multiples of twelve seconds from periapsis. No data ~~is~~ are entered for the 0 index point. In each twelve second interval the average of all non-zero densities measured for each ion is computed. If there are no non-zero values, a zero average is identified. Since a zero value is an indication that the density is below a certain threshold, we do not average the zero values in with the non-zero measurements.

Ion measurements determined to be suspect for any reason are flagged and not included in the data base. In earlier transactions of data to the data base, these values were left with the original fill data, and identified as 'NO Change' fill character (HEX 'FFFFFFFF'). Because the 'NO CHANGE' cannot replace a previously entered value, this left no means of deleting a point which might have been entered in error. We have more recently begun to insert the 'NO DATA AVAILABLE' fill character (HEX '7FFFFFFF') for those points to be omitted.

```
$NOP      ******   GSOUT1  *****
$EXE TPLIST BS

INPUT PARAMETERS ARE: ED FL=1=1 1

 TAPE NO.   1              FILE NO.   1
 RECORD     1              LENGTH     266
000178:33914:41:22.81715:41:10.817              ORAD  00/00/000000000000EFD  04/15/81150500000ETP  12/
18/8100451590IMS   01/01/8100000000000MAG  04/15/81180600000NMS  06/23/80000060200PA   00/00/00000000
000RPA  06/12/8001262583OUVS  00/00/000000000000SEDR  11/13/7960200000

 TAPE NO.   1              FILE NO.   1
 RECORD     37             LENGTH     266
003779:01018:21:47.81619:21:35.816              ORAD  00/00/000000000000EFD  12/16/81150500000ETP  12/
18/8102230976OIMS  00/00/000000000000MAG  12/16/81180600000NMS  07/12/80004259780PA   00/00/00000000
000RPA  06/17/8000002709OUVS  00/00/000000000000SEDR  06/11/7960200000

***** JOB DONE.
$WEO LPS

$$
$ASS IN TD3 OUT MT2
$EXE TPDUPC BS
```

2
2

~~12/05/78 - 01/10/79~~
D-48011

12/05/78 - 01/10/79

OGP E

```
$NOP
$NOP
$NOP
$NOP **** GSOUT-2 ********
$EXEC TPLIST BS

INPUT PARAMETERS ARE:  ED FL=1=1 1

 TAPE NO.   1            FILE NO.   1
 RECORD   1              LENGTH   266
003879:01118:26:33.81619:26:21.816              ORAD  00/00/00000000000EFD  12/16/81150500000ETP  12/
18/8102350969OIMS  00/00/00000000000MAG  12/16/81180600000NMS  07/12/80012143940PA   00/00/00000000
000RPA  06/17/80012325860UVS  01/12/81012616800SEDR  08/16/7960200000

 TAPE NO.   1            FILE NO.   1
 RECORD   125            LENGTH   266
016279:13520:56:32.81521:56:20.815              ORAD  01/28/82113400000EFD  07/13/81150500000ETP  12/
16/8101571047OIMS  10/20/80027343200MAG  07/13/81180600000NMS  10/23/80013743780PA   00/00/00000000
000RPA  07/09/80022724820UVS  01/07/81018616200SEDR  10/03/8060200000

***** JOB DONE.
$WEO LPS
```

01/11/79 - 05/15/79
D-48012

No mark-ups or other printouts except for old tape (D) numbers & time spans ⇒ printouts are removed. 8/96

```
$$
$ASS IN TD3 OUT MT4
$EXEC TPDUPC BS
```